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Poliomyelitis in North Carolina in 1935*

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NORTH Carolina has had much publicity this year because of its poliomyelitis epidemic. Inasmuch as this epidemic was one of the few ever described in a latitude so far south, it was not only of newspaper interest but also of scientific interest.

North Carolina is about 650 miles in length from its coastal boundary to its western mountainous boundary. The epidemic of poliomyelitis was confined largely to the east central section about 200 miles from the coast and 300 from the mountains. Considering the length of the state, our coastal and mountainous sections were as far removed from the center of the epidemic as though it had occurred at some distant point, *e.g.*, Washington, D. C., or possibly Savannah, Ga.

In studying our outbreak of poliomyelitis it may be interesting to observe that North Carolina lies in about the same latitude as southern California, approximately 36° north. The longitude is between 75° and 90° west. We have, from May through October, a mean temperature of 60.06°, and a mean rainfall of 27.57 inches. From November through April we have a mean temperature of 47.45° and a mean rainfall of 21.90 in. Eastern North Carolina has a mean temperature of 62.1° and a mean rainfall of 4 in.; central North Carolina a mean temperature of 60.2° and a mean rainfall of 3.99 in.; western North Carolina a mean temperature of 54.5° and a mean rainfall of 4.46 in. The only other recorded epidemic of poliomyelitis in this latitude comparable in extent to that in North Carolina this summer occurred in Southern California in 1934.

The average number of cases of poliomyelitis for the past 5 years has been approximately 73 cases per year. Our peak year, prior to 1935, was 1929 in which we had 133 cases reported. From January through October, 1935, 641 cases had been reported to the State Board of Health, with 59 deaths. The attack rate per 100,000 for the epidemic was 19.62; the death rate approximately 9 per cent.

In the preëpidemic period, January

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through May 15 this year, 39 cases and 11 deaths were reported. The epidemic appeared in the last half of May, with 59 cases reported for 2 weeks; 232 cases were recorded as having their onset in June; 204 in July; 56 in August; and 36 in September. The peak of the epidemic, by onset, occurred in June. Reviewing the records of poliomyelitis in North Carolina for the past 10 years, we find that the highest incidence occurred in August, with an average of about 18 cases.

Analysis of cases for 1935 reported as having onset January–September (622 cases) shows 8 per cent were under 1 year of age, 43 per cent were 1 to 4 years, 27 per cent 5 to 9, 9 per cent 10 to 14, 5 per cent 15 to 19, 2 per cent 20 to 24, 2 per cent 25 to 34, and 3 per cent 35 years and over (unknown age: under 1 per cent). The age distribution is noticeably greater in the 5–9 year group than in the past 5 years.

Of 622 cases, 338, or 54 per cent, were males; 284, or 46 per cent, females; 480, or 77 per cent, were white; 124, or 20 per cent, Negroes; 14, or 2 per cent, Indians; 4 race unknown.

Sixty-five per cent were rural and 35 per cent urban. The term "rural" applies to towns of less than 2,500. The attack rate per 100,000 among whites was 21.48; among Negroes, 13.50; among Indians 84. The population of North Carolina is 70 per cent white, 29½ per cent Negroes, ½ of 1 per cent Indian.

Among the 641 cases reported January–October there were 12 in which 2 occurred in the same family. Three had onset the same day as the original case; 2, 1 day later; 3, 2 days later; 1, 4 days later; 1, 6 days later; 1, 8 days later; and 1, 13 days later.

From the 181 case investigations the following information was obtained: 142 had spinal type of paralysis with 1 death; 14 had bulbar type of paralysis with 9 deaths; 6 had mixed types (bulbar-spinal) paralysis with 2 deaths; and 19 were non-paralytic.

Of the 100 counties, 80 reported poliomyelitis. Johnston, in the east central section, had the highest attack rate: 85.03 per 100,000; 52 had an attack rate of 10 or higher per 100,000. The mean average attack rate for the entire state for 14 years has been 1.9 per 100,000. Wake County (in which Raleigh is situated), adjoining Johnston, reported the highest number of cases, 55. Durham County, adjoining, 51 cases; Johnston, 49 cases. If there was any radial spread from Raleigh (which we may consider as having been the center of our epidemic), it was in a northerly and northwesterly direction. The counties just north of Wake border on Virginia.

The control policies adopted by the North Carolina State Board of Health during this epidemic are summarized as follows:

1. Immediately upon the appearance of an abnormal incidence of this disease, county and city health officers in North Carolina were informed by letter of the control policies of the State Board of Health.

2. Attendance at public gatherings, irrespective of nature, was strongly discouraged, especially for children.

3. Summer camps were advised not to admit patrons from affected areas.

4. Summer camps were advised not to permit unrestricted visiting by their patrons.

5. The Board of Health, by press, radio, and correspondence, warned against treatment by "quacks" and the use of untried medical "cures."

6. The Board of Health advocated the use of prophylactic vaccines *only* in controlled studies.

7. The Board furnished to each physician reporting one or more cases of poliomyelitis a copy of "Practical Suggestions on Poliomyelitis," a digest prepared by a Special Committee on Poliomyelitis for use in connection with the Poliomyelitis Scientific Exhibit at the Milwaukee Session, 1933, of the American Medical Association. It was hoped that this pamphlet would be helpful

to those physicians who were seeing poliomyelitis in their practice for the first time or after an interval of many years. It was felt that this was a service that the board could distinctly render, and the comment received from various physicians of the state was favorable.

8. The board also furnished to physicians, for each case reported, a questionnaire form to be filled in and returned. To date 181 of these have been returned and are analyzed elsewhere in this paper.

9. The board rendered consultant diagnostic service to any physician requesting it.

10. The board advised that all suspicious cases of poliomyelitis be treated as poliomyelitis until definite diagnosis was made.

Since the State Board of Health is state-supported, it was felt that any information on this epidemic collected by the board was public property and, therefore, factual information was made available at all times.

The poliomyelitis vaccines manufactured by Kolmer and Brodie were used in North Carolina during the epidemic. The Brodie vaccine was used in control studies; the Kolmer vaccine was used by private physicians.

CONCLUSIONS

During the epidemic observation led the board to conclude that:

1. A daily bulletin, in which facts are given, inspires confidence, secures coöperation, and dispels fear.

2. Early diagnosis and specialized care are the best means of preventing permanent paralysis.

3. The best means of prevention is in avoiding contacts.

4. So far, nothing has been learned from the vaccination of the 300 children in the City of Greensboro, with the Park-Brodie poliomyelitis vaccine. No cases of poliomyelitis have developed in either the control or the vaccinated groups.

5. This is also true of the Kolmer poliomyelitis vaccine, no complete records being available. Of this vaccine 3,327 c.c. was distributed by Dr. Kolmer to North Carolina physicians; the number of persons inoculated is not known.

6. In the experiment with the Park-Brodie vaccine, local abscesses occurred in 6 per cent of cases; 12 per cent developed nodules at the site of intradermal inoculation; 12 per cent developed medium size indurations.

7. A check of the field experiment, by laboratory immunity tests on both the vaccinated and the unvaccinated children, would be of considerable value in determining the efficacy of the vaccine. This check is already being made.

8. One in 4,600 developed the disease. Assuming that the vaccine is 100 per cent effective, is it a wise public health procedure to use it when the attack rate is so low?

9. Assuming that the vaccine is effective, would not the reactions, abscesses, nodules, indurations prevent its general use?

10. Assuming that the vaccine is effective, would not the incidence of the disease decry its general use?

11. Assuming, again, that the vaccine is effective, would not the potential danger of its producing paralysis decry its use?

12. If public health officials were to advocate a vaccine whose value had not been demonstrated, it would reflect itself in the loss of public confidence in those vaccines whose value is definitely known.

We must know the past to appreciate the present and prepare for the future.

Poliomyelitis in Virginia During 1935*

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PREVIOUS to this year there have been 2 periods in which there was an unusual prevalence of poliomyelitis in Virginia—in 1916 and 1917 when the cases were distributed throughout the state, and in 1929, when cases occurred particularly in the southwest section. There are on record 345 cases in 1916; 318 in 1917; and 325 in 1929.

Records of the State Department of Health show that poliomyelitis was first reported in Virginia in July, 1910, and in that year there were 679 cases, a number greater than in any succeeding year until the present. Up to November 1, 1935, 674 cases and 37 deaths from poliomyelitis have been reported to the State Department of Health. The June cases showed the usual symptoms of poliomyelitis including paralysis or definite muscular weakness, and the expected age distribution of between 70 and 80 per cent of the cases under 10 years of age. Most of these cases were reported from the southern counties bordering on North Carolina where the disease appeared to be unusually prevalent. From the southern counties the disease spread, apparently along the routes of travel, into several sections of the state, though it reached epidemic proportions in only a few counties. As can be seen in Figure I, a peak was reached in the week ending July 20. After a slight recession lasting about 1 week, a wave of cases showing no paralysis or muscular weakness, classified as non-paralytic, first appeared in Richmond. Later, cases developed in Albemarle County, Roanoke County, and other sections.

Coincident with the change in the type of cases reported is the change in age distribution. Up to August 1, 67.7 per cent of the patients were under 10 years of age; by August 14 the percentage under 10 had dropped to 62.2 and by September 1 to 59.7 per cent.

This change in the clinical type of cases reported and their age distribution is brought out more clearly in Figure II. To date, 525, or approximately 80 per cent of the questionnaires sent to physicians reporting cases of poliomyelitis, have been received and analyzed. The cases have been divided into 2 groups: those showing paralysis or any muscular weakness, however slight or transitory (271), and those having no paralysis or weakness (254). The solid line shows the paralyzed and the dotted line the non-paralyzed group, plotted by date of onset.

The cases in the paralyzed group are best described as typical poliomyelitis, having the usual symptoms including more or less extensive paralysis or muscular weakness—67.5 per cent of the cases in this group were under 10

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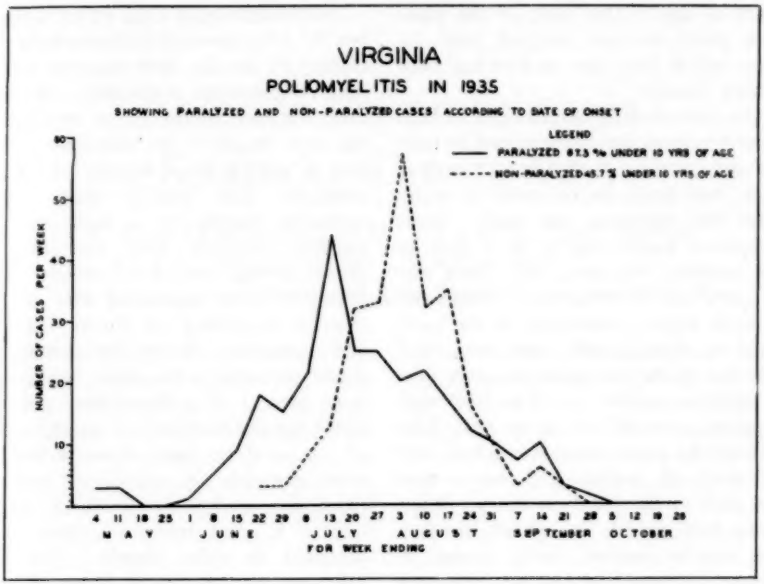
VIRGINIA
POLIOMYELITIS IN 1935
SHOWING PARALYZED AND NON-PARALYZED CASES ACCORDING TO DATE OF ONSET
LEGEND
PARALYZED 81.3 % UNDER 10 YRS OF AGE
NON-PARALYZED 45.7 % UNDER 10 YRS OF AGE
NUMBER OF CASES PER WEEK
4 11 18 25 1 8 15 22 29 6 13 20 27 3 10 17 24 31 7 14 21 28 5 12 19 26
MAY JUNE JULY AUGUST SEPTEMBER OCTOBER
FOR WEEK ENDING

FIGURE I

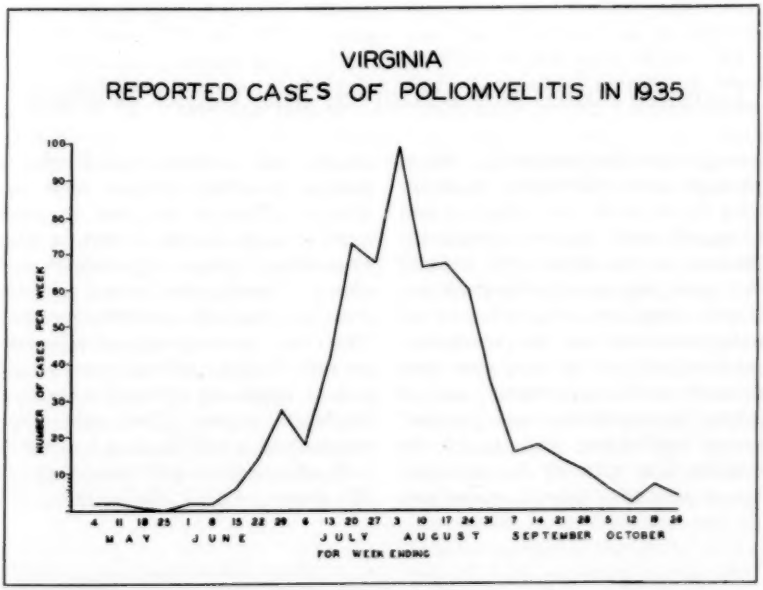
VIRGINIA
REPORTED CASES OF POLIOMYELITIS IN 1935
NUMBER OF CASES PER WEEK
4 11 18 25 1 8 15 22 29 6 13 20 27 3 10 17 24 31 7 14 21 28 5 12 19 26
MAY JUNE JULY AUGUST SEPTEMBER OCTOBER
FOR WEEK ENDING

FIGURE II

years of age. The peak of the cases with paralysis was reached July 13, since which time the decline has been almost steady.

The cases showing no paralysis or muscular weakness are characterized by nausea and vomiting, a slightly stiff neck or back, and headache so severe in many cases that morphine was used. These symptoms lasted only 2 or 3 days in the majority of cases, and there was no paralysis or weakness. Moreover, a much higher percentage of the cases were in older people, for only 45.7 per cent of the non-paralytic cases were in children under 10. The first non-paralytic case did not occur until June 22 and the peak was not reached until the week of August 3, 2 weeks after the peak of the paralytic cases. When these two curves are added together, the double peaked curve shown in Figure I is produced and the increasing age of the reported cases is explained.

To summarize, in 1935 up to November 1, 674 cases of poliomyelitis, including 37 deaths, were reported to the State Department of Health. The disease reached almost every section of the state though it was unusually prevalent in only a few counties. It is remarkable how readily these cases, occurring mostly in a little over 2 months, separate into two distinct groups having marked differences. The paralytic cases, appearing first in the counties bordering on North Carolina and spreading along the routes of travel throughout the state, had symptoms typical of poliomyelitis, and the usual age distribution. A second wave, of non-paralytic cases, characterized by short duration of symptoms, and no paralysis, reached its peak 2 weeks later. A great many of these cases occurred in older people. The significance of these facts is as yet undetermined.

Federal Funds for Maternal and Child Welfare

IN each state the responsible official through whom the federal funds for general health work and maternal and child health work will be administered is the state health officer. He is faced with a great responsibility and will undoubtedly need the coöperation of all thinking citizens within his jurisdiction. It is obvious that, if the maximum sums authorized are appropriated and if matching appropriations are provided by state legislatures, state health departments will suddenly be possessed of larger sums than they have ever previously had to administer. Sudden expansion is always fraught with great danger. There is no time to experiment on a small scale, to test, to weigh, to modify, to adapt or perhaps to reject plans. Among the gravest problems will be that of qualified personnel. There is a great dearth of adequately trained health administrators, sanitarians, engineers, technicians, and public health nurses. The training provisions which will be found in the act will take time to put into effect.—W. W. Bauer, *A.M.A. Bull.*, Dec., 1935.

Anterior Poliomyelitis in Kentucky During 1935*

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POLIOMYELITIS in Kentucky has shown a fairly definite periodicity between 1911 and 1935, the increases in incidence recurring at approximately 7 to 8 year intervals. The expectancy during interepidemic years averages from 20 to 40 cases annually. The last epidemic year previous to 1935 was 1927, when 192 cases were reported.

The 1935 epidemic really began in 1934, when 118 cases of poliomyelitis were reported. This was a very marked rise in prevalence compared with the years between 1927 and 1934, during which the annual average was 37 cases. Approximately 90 per cent of the cases reported in 1934 occurred during the summer and early fall. The disease abated during November and December, 1934, and only 8 cases were reported in the state from January 1 to July 1, 1935. During July the incidence showed a sudden and marked rise, 43 cases being reported. Of these, 23 occurred in 2 adjacent counties in the southwestern part of the state, Warren County reporting 12 cases and Edmonson County 11 cases. During that month the disease showed a gradual increase in prevalence also in Louisville and Jefferson County, 9 cases being reported from the City of Louisville. Hence, Warren, Edmonson, and Jefferson Counties constituted the 3 chief foci of prevalence of poliomyelitis in Kentucky in July. The remaining 11 cases reported during that month were in widely scattered sections of the state.

During August, 114 cases were reported, 61 of which occurred in Louisville and Jefferson County, the remaining 53 reported cases being fairly uniformly distributed among 12 counties lying southwest of Louisville, in what is known as the Mississippi Plateau, with an occasional case in the eastern and far western parts of the state.

In September, reports of 97 cases came in, 39 of which were in Louisville and Jefferson County. The other 62 cases were distributed among the 12 counties which lie southwest of Louisville.

During October, Louisville and Jefferson County showed a marked decrease in prevalence, but were still reporting more cases than any other single locality in the involved area. The situation in the rest of the infected part of the state was also showing definite and distinct improvement. Cases reported in October aggregated 46, of which 14 were in Louisville and Jefferson County, the remaining 32 distributed throughout the rest of the infected section of the state. The number of cases reported during the first week of November indicates that prev-

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alence of the disease is now back to what may be considered normal.

SUMMARY

A total of 308 cases of infantile paralysis in Kentucky was reported from January 1 to November 1, 1935. The months of greatest prevalence were July, August, September, and October. The section of the state showing the highest incidence comprises Louisville and Jefferson County and an area southwest of Louisville, known as the Mississippi Plateau and embracing Bullitt, Nelson, Hart, Barren, Edmonson, Grayson, Breckinridge, Warren, Logan, Muhlenberg, Hopkins, and Daviess Counties. This section includes about one-fourth of Kentucky's area.

Reported deaths due to poliomyelitis numbered 25, giving a specific fatality rate of 8.3 per cent. Approximately 67 per cent of those recovering from attacks of the disease showed some degree of paralysis, which ranged from a slight weakness in a single muscle group to a profound paralysis of one or more extremities. Fifty-seven per cent of the cases occurred in males; 43 per cent in females. Ninety-one per cent were in white children; 9 per cent in colored children. Cases and deaths in the various age groups are shown in Table I.

TABLE I

Age Group	*Cases*	*Deaths*
0- 4	137	17
5- 9	86	4
10-14	50	2
15-19	21	2
20 up	14	0
Total	308	25

It will be noted that the age group in which most cases occurred was that under 5 years. Seventeen of the 25 deaths were in children in this group.

New York Poliomyelitis Report Issued

A PRELIMINARY report on the poliomyelitis epidemic of 1935 has been published by the New York City Department of Health. About 1,900 cases had been registered up to the time of this report in October, which compares with 4,100 in 1931 and 9,000 in 1916.

The report points out the shifting of the incidence to the higher ages. In 1907, 86.6 per cent of the cases were in children under 5 years of age. In 1935, 32.8 per cent occurred in this age group. The case fatality also varied in these four epidemics. In 1907 the case fatality rate was estimated at 5 per cent; in 1916 it was 27 per cent, in 1931, 12.18 per cent, and in 1935, 4 per cent.

Of particular interest to administrative health officers will be the fact that, after due consideration, it was decided to open the city schools at the regular time. The department believes that this policy was sound because of the fact that no increase in prevalence followed the opening of the schools.

Poliomyelitis in Tennessee*

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THE poliomyelitis problem in Tennessee for 1935 hardly justifies a report at this time since the actual number of cases was only slightly in excess of the average incidence experienced through recent years. Fortunately for the public, the greatest prevalence was noted in the newspapers and practically every case occurring was commented on in more than one paper.

The disease reached epidemic proportions in only 2 areas of the state. The greatest problem was found in the 4 counties of East Tennessee located in the extreme northeastern section of the state immediately adjacent to North Carolina and Virginia. The second area was in the northwest portion of Middle Tennessee, adjacent to the Kentucky line.

For the first 10 months of 1935, 78 cases with 15 deaths have been reported. For the corresponding period of 1934, there were 59 cases and 27 deaths. The case fatality rates were 19.2 and 45.4 for the years 1935 and 1934, respectively. While we have no evidence to support the statement, it is quite likely that the majority of cases reported were those showing paralysis; hence, the actual number of cases known is much smaller than it is reasonable to assume occurred. The distribution of cases was more or less normal, and while the number of cases is rather small it is interesting to note that 62 per cent of those reported were in children under 10 years of age, with 72 per cent residing in rural areas. The case incidence, based on proportionate population, in the white was about twice that in the colored. The epidemic, if we may call it that, reached its highest incidence on or about August 1.

The following control measures were advocated:

1. Encouragement of prompt reporting by physicians and others of all positive or suspected cases with rigid quarantine of all cases and contacts. While the control procedure may or may not have been of any particular aid in controlling the epidemic, nevertheless, for policy's sake, it was deemed advisable to do something.

2. Newspaper articles in the form of general preventive measures released from time to time. An effort was made to give facts and at the same time avoid arousing public hysteria.

3. In two of the eastern areas, which incidentally were quite closely connected with the North Carolina and Virginia areas, being on the main transportation routes, the local boards of health instituted control measures for the younger age group—all children under 15 years of age were required to remain away from school, public gatherings, and downtown areas for a period of 2 weeks. While this may not have had any effect, it is interesting to observe that the disease apparently subsided with the institution of these measures.

4. Diagnostic consultant service available through the State Health Department to all part- and full-time county health officers upon request. There was no state-wide program for rendering assistance in the treatment of reported cases.

5. Immunizing agents in the form of vaccine (Park-Brodie, and Kolmer products) were neither recommended nor used as a routine control measure.

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Poliomyelitis in Charlottesville, Virginia, and the Adjacent County of Albemarle*

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WITHIN the past few months poliomyelitis has been reported throughout the State of Virginia to an extent never before recorded. Not since the influenza epidemic of 1918 and 1919 has the populace of this state been so acutely concerned with its state of health, and undoubtedly there has been sufficient cause for this very manifest anxiety. It must be admitted that in certain sections of Virginia poliomyelitis has occurred in serious epidemic proportions. Charlottesville and Albemarle County have been publicly referred to as a "hot bed" of poliomyelitis; and if one cares to base an opinion on figures made public, this would certainly seem to be a proper characterization.

In the clinics at the University of Virginia Hospital we have observed 111 patients who, in our opinion, were suffering from poliomyelitis and were so certified to the proper authorities. In every case the diagnosis was confirmed or strongly suggested by examination of the cerebrospinal fluid. The purpose of this paper is to describe clinically these cases as we have observed them, and to discuss briefly certain very pertinent facts of medical interest and importance. In view of the difference of opinion and conflict of emotions resulting from our recent experience, a discussion of this subject would seem particularly desirable at this time.

When poliomyelitis first appeared in Charlottesville and surrounding sections, it became necessary for the University Hospital to adopt a policy concerning the admission of cases of this disease. Due to physical conditions which made impossible adequate isolation of patients, hospital authorities made it a rule to accept no patient who could be adequately cared for in the home. The majority of the patients described in this report were, therefore, seen in the out-patient clinics. Thirty-eight were observed by those in charge of the adult service, and 73 by those in charge of the pediatric service. Since it was necessary to return these patients to their homes, in many instances only one examination was afforded during the acute stage of the disease. In evaluating this series, particularly as regards the frequency of any one sign or symptom, it must be remembered that the majority represent out-patient cases, most of them seen only once. Nineteen patients were treated in the hospital, and afforded a better opportunity for study. Forty-seven of the patients from the department of pediatrics were subsequently

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brought back for a follow-up examination after the period of quarantine had expired.

As with previously reported epidemics the disease has been observed chiefly in children and young adults. The youngest case was 8 weeks of age and the oldest was 35 years. Table I shows the incidence in the various age groups.

TABLE I

AGE GROUPS

Youngest 8 weeks		7 to 8 years	6
Under 6 mos.	5	8 to 9 years	7
6 mos. to 1 yr.	3	9 to 10 years	3
1 to 2 years	6	10 to 11 years	5
2 to 3 years	13	11 to 12 years	3
3 to 4 years	3	12 to 15 years	12
4 to 5 years	6	16 to 20 years	9
5 to 6 years	8	21 to 25 years	12
6 to 7 years	5	26 to 30 years	4
		31 to 35 years	1

Under 12 Years	73 Cases
Over 12 Years	38 Cases

The onset has been sudden and characterized in most instances by fever, headache, vomiting, and stiffness of the neck and back, this stiffness being associated with pain in many instances. This group of symptoms has been so constantly present that the history of one might well serve for the majority. This has been especially true as regards the older children and adults.

Fever was present at the time of examination in 60 cases. While the recorded temperature of our patients varied from normal to 105° F., it must be remembered that the degree of temperature naturally varied in relation to the time of onset. The average temperature at the time of examination ranged from 101° F. to 102° F.

Headache was the most common finding, occurring in 83 of the 111 cases. The headache was usually frontal and was made worse when the patient attempted to sit up. The incidence of headache was very striking, even in the younger children, and it must be admitted that headache is not a common childhood complaint.

As in previous epidemics the most pathognomonic of all signs was stiffness of the neck and spine. Efforts to induce flexion of the spine caused marked "splinting" in a fair proportion of our cases, and evidence of stiffness of the neck and back was noted in 37.9 per cent. A typical "poker spine" was observed more frequently in older children and adult patients.

Nausea or vomiting occurred 69 times as an early sign, and diarrhea 10 times. In some instances vomiting was a very troublesome feature, and interfered with symptomatic treatment.

Sore throat was a complaint in 5 instances, and many patients not complaining of soreness showed on inspection marked injection of the tonsils and posterior pharyngeal wall. Coryza was noted in only 2 instances.

Hyperesthesia was noted less frequently perhaps than in previous epidemics. Pain in the extremities was present in 10 patients; 20 complained of abdominal pain; and 1 was sent to the hospital by the attending physician with a diagnosis of acute appendicitis. A not infrequent sign was pain and soreness when the eyes were rotated and occasionally these patients objected to bright light.

Listlessness or actual drowsiness was observed 17 times. Convulsions were noted in 2 patients, the older being 5 years of age and the younger 2 years.

Change in the reflexes was common. Exaggerated reflexes early in the disease was the rule; examination later often showed marked diminution or actual loss of deep reflexes previously hyperactive. We agree with other observers that reflexes in infants and very young children are apt to be uncertain and unreliable. It may be stated with a reasonable degree of accuracy that reflex changes were present in 47.8 per cent of our cases.

TABLE II

SYMPTOMS AND SIGNS

	Cases	Per Cent		Cases	Per Cent
Headache	83	74.7	Pain in extremities	10	9.0
Vomiting	62	55.9	Nausea	7	6.3
Temperature on examination	60	54.0	Sore throat	5	4.5
Change in reflexes	53	47.8	Difficulty in breathing	3	2.7
Pain and stiffness of neck or back	42	37.9	Dizziness	2	1.8
Evidence of muscle weakness	24	21.6	Coryza	2	1.8
Pain in abdomen	20	18.0	Convulsions	2	1.8
Listlessness or drowsiness	17	15.3	Unable to void	2	1.8
Diarrhea	10	9.0	Enlargement of spleen	2	1.8
			Unable to swallow	1	0.9

Respiratory difficulty was observed in 3 patients and in 1 this made necessary the use of the respirator over a long period of time.

Retention of urine was noted in 2 instances, being sufficiently obstinate to require the use of a catheter. In both patients this condition was completely relieved in a few days.

Enlargement of the spleen was a confusing finding in 2 patients, and typhoid fever with meningismus had to be ruled out as a probable diagnosis. The usual laboratory procedures diagnostic of this disease were negative. The subsequent course of the disease substantiated the diagnosis of poliomyelitis.

Table II shows the frequency of the various symptoms and signs observed.

A most interesting feature has been the infrequency of paralysis compared with the number of individuals affected. Twenty-four of our 111 cases showed definite muscle weakness or actual paralysis. It must be remembered that the majority of the patients were seen only once, and that transient muscle weakness may have occurred and probably did occur subsequent to our examinations. It is by no means easy to measure muscle weakness in certain groups of muscles and we admit that our ability to detect this sign improved very noticeably with further acquaintance with the disease. This was particularly true with infants and young children. It seems likely that physicians for many months to come will see patients with weakness in certain muscle groups as well as changes in posture and other evidence of diagnosed and undiagnosed poliomyelitis. We were able to detect muscle weakness in 21.6 per cent of the patients, and a considerable number showed weakness or actual paralysis after being discharged from quarantine.

The various regions of the body showing muscle weakness or actual paralysis are indicated in Table III.

TABLE III

TYPES OF PARALYSIS

Paralysis of one or both legs	10
Paralysis of one or both arms	5
Combined paralysis of legs and arms	5
Isolated paralysis of cranial nerve	2
Combined paralysis of spinal and cranial nerves	3

Total—24 patients or 21.6%

The average duration of acute symptoms was 3 to 5 days. In 25 cases in which this fact could be accurately determined the average was 4.4 days. An illness of 36 to 48 hours was frequent.

SPINAL FLUID

One or more spinal fluid examinations were made in each case. All laboratory tests were done under the

direction of Dr. William E. Bray, Professor of Clinical Diagnosis, at the University of Virginia, and we acknowledge our appreciation of his helpful advice and coöperation.

In every instance the spinal fluid was noted as clear or, at most, slightly opalescent. The pressure appeared normal or perhaps slightly increased in a few instances.

Increase in cells while present in most cases, has been a variable factor. It is generally accepted that the earliest pathological change in the nervous system is hyperemia. It is not surprising that marked differences in the cell count have been observed in this series of cases as in all others reported. The degree of cell increase was in no way proportionate to the severity of symptoms or the occurrence of paralysis. A cell count above 12 has been considered an abnormal finding. In this series we found 39 cases with a cell count less than 12 but in every one there was a noticeable increase in spinal fluid protein. What one finds in the way of cell increase may vary with the time at which lumbar puncture is performed. We found 39 cases in which lumbar puncture, performed within 24 to 36 hours of the acute illness, showed only increase in the protein content of the spinal fluid. Punctures performed several days later on 8 of these patients showed the characteristic cell increase in 3. Our observation of the cell count has ranged as follows: 39 cases with a count below 12; 26 between 20 and 60; 13 between 60 and 100; 12 between 100 and 200; 15 above 200. Twenty cases at the time of first lumbar puncture had no cells, and the highest had 1,480 cells. The average for all cases showing definite cell increase was 155.4 cells. In 41 cases the type of cell was of the lymphocyte variety, while in 47 polymorphonuclear cells predominated. In 3 instances the cell types were equally divided. Polymorphonuclear increase was frequent in those cases showing marked cell increase.

We have been interested in protein increase as a sign of central nervous system involvement, and have reported as poliomyelitis 39 cases in which protein increase was the only spinal fluid finding indicative of the disease, 6 of which showed typical cell increase later. Our reasons for reporting such cases seem to us sufficient. Very early in our experience we observed a case with marked paralysis of the face and arm in which protein increase was noted without increase in cell count. We note that Levinson [2] has recently reported 5 cases with muscle weakness in which there was no increase in cells, to which 5 cases we are glad to add 11 more. It is, of course, to be supposed that we have certified no case

TABLE IV

SPINAL FLUID ANALYSIS

	Number of	*Cell Type*			*Globulin*				
Number of Cells	*Cases*	*Pmn*	*Lymph*	*Equal*	*Normal*	*1+*	*2+*	*3+*	*4+*
None	20	0	0	0	..	8	8	3	1
Below 12	19	4	14	1	1	8	8	2	0
12– 20	6	3	3	0	..	3	2	1	0
20– 60	26	12	13	1	1	14	11	0	0
60–100	13	7	6	..	2	3	6	1	1
100–200	12	9	3	..	..	4	2	3	3
200–400	7	4	2	1	..	2	1	2	2
400–600	6	6	0	..	..	2	1	2	1
Over 600	2	2	0	..	..	0	1	1	0

TABLE V

CASES SHOWING INCREASED PROTEIN AND CELL COUNT UNDER 12 CELLS

Days from Onset, 1st Puncture	Cells	Glob.	Stage of Illness	Weakness	Days from Onset, 2nd Puncture	Cells	Glob.	Stage of Illness	Weakness
4	0	1+	Acute	No	6	143	2+	Convalescing	No
1	0	1+	Acute	No	5	6	2+	Acute	No
1	0	1+	Acute	No	3	0	2+	Convalescing	No
2	12	1+	Acute	Left leg					
2	2	2+	Subacute	Both legs and arms					
1	6	2+	Acute	No					
3	0	2+	Acute	No					
4	0	2+	Acute	No					
7	0	3+	Acute	Right leg					
7 hours	0	2+	Acute	No					
3	0	2+	Subacute						
3	0	3+	Subacute	No					
2	0	0	Acute	No	8	42	1+	Subacute	Right leg
2	0	2+	Acute	No					
12 hours	0	1+	Subacute	No					
1	0	1+	Acute	No	3	0	2+	Convalescing	No
2	0	3+	Acute	Left leg					
7	0	2+	Acute	Right leg					
2	0	2+	Acute	No					
2	0	0	Acute	No	5	14	3+	Acute	No
1	0	1+	Acute	No					
3	0	1+	Acute	No					
7	0	4+	Acute	Right leg	15	0	3+	Subacute	Right leg
2	0	1+	Acute	No					
4	0	1+	Acute	Right leg					
2	12	0	Acute	No					
3	5	1+	Subacute	No					
1	11	2+	Acute	No					
7	3	1+	Subacute	Right facial and arm					
1	11	1+	Acute	No					
5	1	3+	Acute	No					
18 hours	10	1+	Acute	Both hands					
7	1	2+	Acute	No					
12 hours	10	1+	Acute	Both hands					
8	1	2+	Convalescing	No					
12 hours	7	3+	Acute	No					
1	5	1+	Acute	No					
2	1	2+	Acute	No					
12 hours	1	1+	Acute	Right leg					
12 hours	1	1+	Acute	No	3	10	2+	Subacute	Unable to void
2	10	2+	Acute	No					

CASES WITH 2 OR MORE LUMBAR PUNCTURES

Days from Onset, 1st Puncture	Cells	Glob.	Stage of Illness	Weakness	Days from Onset, 2nd Puncture	Cells	Glob.	Stage of Illness	Weakness
1	0	—	Acute	No	5	85	0	Acute	No
1	0	0	Acute	No	4	96	2+	Subacute	No
4	0	1+	Subacute	No	7	143	2+	Convalescing	No
1	0	1+	Acute	No	5	6	2+	Subacute	No
1	0	1+	Acute	No	3	0	2+	Acute	No
2	510	1+	Acute	No	4	115	1+	Subacute	No
12 hours	14	2+	Acute	No	5	360	4+	Convalescing	No
2	0	0	Acute	No	8	42	1+	Subacute	Right leg
1	0	1+	Acute	No	4	0	2+	Convalescing	No
3	24	2+	Acute	Bulbar throat	13	3	4+	Subacute	Bulbar
2	0	0	Acute	No	5	14	3+	Acute	No
12 hours	1	1+	Acute	No	2	10	2+	Acute	Unable to void
Several hours?	280	2+	Acute	No	6	3	2+	Convalescing	No
7	0	4+	Acute	Right leg	15	0	3+	Convalescing	Less extensive
1	1480	3+	Acute	No	2	347	4+	Acute	No

as poliomyelitis, with protein increase as the only spinal fluid finding, that was not supported by adequate symptoms and signs of the disease. It is felt that too little emphasis has been placed on the possible absence of cell increase in poliomyelitis. This feeling has been voiced by other writers.[3, 4, 5, 6] Meals and Bower,[5] have pointed out the error of current medical opinion on this point and have reported a series of cases in which 12.8 per cent had a normal cytology in the spinal fluid, yet showed characteristic neurological findings.

It is realized that protein increase and abnormal cytology have been observed in numerous types of illness. When poliomyelitis is occurring in epidemic proportions these same conditions are not infrequently erroneously classed as examples of this disease.

As a further check in the finding of increased protein in the spinal fluid, we have to date studied 25 patients not suspected of having poliomyelitis. On account of the ease of securing specimens we selected for this group surgical patients receiving spinal anesthesia. Sixteen showed negative spinal fluid findings. Of the 8 showing positive globulin, 1 was found to have a cord tumor; another had previously been diagnosed syphilis of the central nervous system, and showed cell increase as well as protein increase; a third gave a definite history of poliomyelitis within the week preceding the onset of appendicitis; 1 other case had positive serology of syphilis. In 4 instances we were unable to account for increased protein unless the following surgical conditions can be held accountable: acute appendicitis with migraine, carcinoma of the cecum, ruptured appendix, and inguinal hernia.

Spinal fluid sugar determinations were made in 69, and chloride determinations in 50 instances. In no case did these findings suggest some other disease. The average sugar content was 59 mg. per 100 c.c., and the average chloride content was 584 mg. per 100 c.c. of spinal fluid.

In Table V are listed a group of cases all of which had normal cytology in the spinal fluid at the time of the first puncture. It will be noted that in 15 lumbar puncture was done within 24 hours of the onset, and in 11 within 48 hours. The symptomatology differed in no way from other cases which we have observed. Protein increase was present in all but 3 at the time of first puncture.

MORTALITY

Death occurred in 3 patients, 2 as the result of bulbar paralysis, and 1 from pneumonia following a prolonged stay in a respirator. A complete necropsy was obtained in the case reported below.

Hospital No. 118764. H. K., negro male child, 2 years of age, was admitted to the University of Virginia Hospital because of nausea and restlessness of 3 days' duration. Twelve hours before admission the child seemed weak and unable to stand.

Physical examination showed an acutely ill child. Respiration was labored and breathing abdominal. Drowsiness almost to the point of stupor was noted. There was nystagmus of both eyes in the horizontal direction. The throat was injected and a generalized lymphadenopathy was present. There was marked weakness of both legs and arms, more noticeable on the left side. Rigidity of the neck was not present. Knee jerks and ankle jerks were absent and abdominal reflexes could not be elicited. Other reflexes appeared normal.

Temperature on admission was 104° F., respiratory rate was 84 per minute, pulse rate 198. The blood showed 100 per cent hemoglobin, 4,400,000 red and 21,400 white cells. Differential

showed 69 per cent polymorphonuclears and 25 per cent lymphocytes, and one eosinophil. Lumbar puncture showed 372 cells with polymorphonuclears predominating. Pandy's was negative and Ross Jones's 1 +.

Death occurred 4 hours after admission, apparently as a result of bulbar paralysis.

We are indebted to Dr. Albert E. Casey, Associate Professor of Pathology at the University of Virginia, for the following necropsy and pathological report.

NECROPSY AND PATHOLOGICAL REPORT

Cultures of tissues from the spinal cord and from the heart were made in bile and broth. These were found to be sterile.

The gross anatomical findings in this case represent first an enormous enlargement of all lymphoid tissues in the body, particularly noticeable in the Peyer's patches and solitary follicles of the intestines, mesenteric, mesocolic, and retroperitoneal lymph glands. The spleen was enlarged, friable, and the splenic corpuscles unusually prominent. A small reddish nodule was seen on the tunic of one testicle. Small bright red, circular areas, several mm. in diameter, were scattered over the lungs, and there was congestion of the lungs on section. The vessels of the meninges were markedly injected; no discoloration of the cerebrospinal fluid was noted. On cut section there was marked injection of the gray matter, particularly in the cervical spinal cord, in the medulla, areas of the pons, thalamus, lenticular caudate nuclei, but not prominent elsewhere.

The microscopic findings show an enormous enlargement of the germinal centers of lymph follicles throughout the body with diminished mitoses, increased masses of monocytes and endothelial cells and clasmatocytes, with occasional areas of focal necrosis. The peripheral mantel of small lymphocytes was much diminished and in many instances could with difficulty be found. This change involved the lymph follicles of the spleen (splenic corpuscles), of all lymph nodes, solitary follicles, and Peyer's patches. The reticulo-endothelial cells in the lymph sinuses were markedly increased in numbers and occasional neutrophils and eosinophils were seen. The interstices of the lungs were thickened with edema and considerable exudates of monocytes and neutrophils. The pulmonary alveoli were very little affected. The perivascular and lymphatic spaces throughout the body in all tissues showed scattered neutrophils, monocytes and eosinophils. In the meninges, particularly in the thoracic, cervical, and medullary areas, there were moderate numbers of monocytes and neutrophils, the former predominating. The perivascular spaces of the cord, medulla, thalamus, cerebellar nuclei, lenticular and caudate nuclei showed masses of neutrophils and monocytes, the change being possibly most marked in the pons and medulla, and diminishing distally from this area. There were a few small foci of monocytes and neutrophils in the gray matter of the cord or nuclei, not apparently related to the blood vessels. Scattered ganglion cells showed basophilic cytoplasm and hyperchromatic nuclei. Occasional dead cells were noted. In the cord, individual fibers and bundles of fibers show considerable swelling of the myelin. Anterior and posterior portions of the cord and brain were equally affected. The lateral cerebral hemispheres, ventricles, and choroid plexus were little affected. Occasional neutrophils and monocytes were present in the perineural lymph spaces of peripheral nerves. The liver showed a diffuse cytoplasmic fatty change, more prominent near the central veins. No areas of focal necrosis.

In conclusion, the change is that of a generalized infection marked by an exudate of reticulo-endothelial cells of monocytic and clasmatocytic types, of neutrophils and eosinophils. The lymphoid tissues, the interstices of the lungs, the lower cerebral and upper spinal segments being most affected.

RECOVERY OF VIRUS

The spinal cord was placed in glycerine and forwarded to Dr. Charles Armstrong at the National Institute of Health. He recovered a strain of virus capable of causing paralysis in monkeys. This, in so far as we are aware, represents the only instance of the recovery of a virus strain from a case of poliomyelitis in Virginia or North Carolina.

ESTIMATED INCIDENCE IN CHARLOTTESVILLE AND ALBEMARLE COUNTY

Charlottesville and Albemarle County have a population of 42,000. We estimate that 1,500 cases of poliomyelitis

have occurred in the city and county. It seems hardly possible that the University Hospital clinics could have received more than one-tenth of the total number of people affected. The mildness of the recent epidemic lends support to this assumption, and conversations with various physicians further convince us that our estimate is conservative. Numerous physicians admit having seen 50 or more cases presenting symptoms and signs identical with those we have described. The majority of these physicians, having profited by a first experience with poliomyelitis, as have the writers, feel that their patients represented true cases of this disease, although reports of only a few of their cases will be found in the records of our State Health Department. The reasons for failure to report need not be discussed at this time. If the disease here described is poliomyelitis, we must admit a morbidity out of all proportion to previous ideas as to its incidence.

A morbidity rate such as we have described is certainly not in accord with our previous conception of this disease. Figures concerning the morbidity rate of past epidemics of poliomyelitis are largely those of state and federal public health agencies. We are inclined to believe that they do not tell the whole story and that perhaps past epidemics have had associated with them a large number of non-paralytic cases which have never come to the attention of the medical profession. Due to the activities of a very energetic corps of field nurses we have had the opportunity of observing a large number of mild cases, so mild in many instances that they would ordinarily not have sought the services of a physician.

Just how misleading statistics on this subject may be is well illustrated by the following comparison: During the past spring and summer 647 cases of poliomyelitis were reported to the Virginia State Health Department, 191 of these from Charlottesville and Albemarle County. Questionnaires on these 647 cases were productive of 525 answers. Of these 525, 271 had suffered some degree of muscle weakness, and 254 were reported as non-paralyzed, a paralysis rate of 51 per cent. Among the answers received were 191 from Charlottesville and Albemarle County which reported 28 paralyzed and 163 non-paralyzed cases, a paralysis rate of 14 per cent, as compared to 51 per cent for the state at large. Excluding the cases from Charlottesville and Albemarle County, the paralysis rate for the remainder of the state is 72 per cent. If the disease described by us is poliomyelitis it must be admitted that our state statistics can hardly be of any real value in so far as any comparative study is concerned.

The discrepancy can in a large measure be explained by confusion in the medical ranks and the reporting of only paralyzed cases. The reporting of paralyzed cases alone gives no reliable index of the incidence of poliomyelitis in any city or state, and the quarantine of a few paralzed individuals accomplishes little in the way of public protection. Once poliomyelitis becomes entrenched in a community it is doubtful if any system of quarantine can be effective. It would seem to us necessary that we change many of our present ideas concerning quarantine of and the reporting of cases of poliomyelitis.

The very prevalence of the disease together with the low rate of paralysis have been the two features which have led many careful physicians to refuse to admit any unusual occurrence of poliomyelitis in this state, or to advance the idea that we have been dealing with a virus disease other than poliomyelitis, or that we have been dealing with poliomyelitis in addition

to some other disease occurring in epidemic proportions. It is well known that poliomyelitis is a protean disease and that past epidemics have differed one from the other in many particulars. All previously recorded epidemics have had in common certain symptoms and signs which make it seem proper to class them as examples of one and the same disease. The same can be said for the disease that we have described, and until there is adequate proof that we have been dealing with a new and previously unreported condition, we prefer to consider our cases as examples of poliomyelitis. We have seen recently a sufficient number of mild cases confirmed by spinal fluid findings to incline us very strongly to the view advanced by Paul and Trask [1] and others, that certain "characteristic types of minor illness which accompany an epidemic of poliomyelitis, probably represent mild cases of the disease."

It is to be regretted that some serious study attempting to prove or disprove an epidemic of poliomyelitis in this state has not been undertaken. If a new disease can be proved the writer will feel grateful for the opportunity of having observed and studied after a fashion a considerable number of patients so affected.

CONCLUSIONS

One hundred and eleven cases have been described which have had sufficient similarity to previously reported epidemics to stamp as poliomyelitis a recent outbreak of disease occurring in Charlottesville, Va., and adjacent territory. Laboratory data and clinical evidence are supplied which warrant the assertion that in epidemic times normal cytology is no proof that the case in question is not one of poliomyelitis. The finding of increased protein in the spinal fluid is of great diagnostic value and in this series, for practical purposes, has been a constant finding and a very material aid in the diagnosis of early cases.

We cannot consider poliomyelitis solely in terms of its neurological manifestations as is the current medical tendency. We think it proper to consider it as a systemic disease with neurological manifestations in the majority of instances. To think otherwise precludes the probability of diagnosis of early abortive and nonparalytic cases and interferes very materially with a proper conception of its probable incidence.

We are unable to suppose the presence of a new disease, as has been frequently suggested, and feel that this thought may well be the natural reaction of many physicians experiencing for the first time an epidemic of poliomyelitis in all its manifestations. The low death rate and the infrequent occurrence of muscle weakness and paralysis suggest the hope that poliomyelitis may be fast becoming a less malignant disease.

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Results of Field Studies With Poliomyelitis Vaccine*

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DURING the past year lay and medical interest in vaccination against poliomyelitis has been much aroused. With the advent of the 1935 poliomyelitis season it became evident that this interest would be translated into fairly widespread use of the proposed vaccines as prophylactics for the disease. It appeared to the Public Health Service that there was insufficient evidence to justify any general recommendation of them as prophylactics. On the other hand, the vaccine prepared by Dr. Brodie appeared on theoretical and experimental grounds to be reasonably safe, and seemed to offer some hope as a preventive. Realizing that its use would probably be rather extensive, it was felt worth while to observe its application in controlled studies designed to determine its efficacy in preventing poliomyelitis under field conditions. So far as we are aware no such rigidly controlled clinical study has been undertaken to evaluate this, or any other vaccine. It was fully appreciated that the chance of reaching a definite conclusion was slight, and was dependent upon the subsequent development of a sharp outbreak of the disease in the study area, but it was believed that such an attempt should nevertheless be made.

On May 30 one of us arrived in Raleigh, N. C., at the request of the State Health Department. After consultation with officials of the department it was decided to offer assistance in vaccine studies in communities not then involved in the beginning outbreak. For reasons of administrative convenience urban centers were desired as study points rather than rural areas.

It also seemed desirable to avoid communities in which there was already an unusual incidence of poliomyelitis, in order to reduce the risk of vaccinating individuals in the incubation period of the disease.

Because of particular interest shown in Greensboro by 2 practitioners and the health officer, Dr. C. C. Hudson, this city was selected as the first center for the trial. Greensboro was about 80 miles west of the heavily infected focus, but since the epidemic began early in the poliomyelitis season, it seemed reasonable to suppose that Greensboro would eventually be involved. Dr. Hudson arranged a meeting of the physicians there and the proposed study was thoroughly discussed.

It was desired to use the vaccine under conditions simulating those under which it would ordinarily be used except that the choice of individuals to receive it be uninfluenced by any

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factors which could conceivably affect the results, and the follow-up on the vaccinated and unvaccinated be coördinated. The patient-physician relationship was maintained.

Dr. Hudson and the local medical society prepared a statement (approved by one of us) offering the vaccine to the public in the following manner:

The vaccine was offered frankly for study purposes—to determine its efficacy in preventing poliomyelitis under field conditions. It was considered as offering hope as a prophylactic and as being reasonably safe. Parents desiring vaccine for their children under 8 years of age were instructed to list name, address, age, color, and sex with their own physician. The physicians' lists would then be turned over to one of us who would arbitrarily divide them so that approximately half would receive vaccine and half be held as controls. It was made clear that the private physician would have no voice in this selection. The inoculations were to be done in the physicians' offices during office hours and those selected would be notified by us when to report for vaccination. No effort was made to urge vaccination, or to urge physicians to recommend it.

Lists were first received from physicians during the third week in June. The method of selection employed was alphabetical. The names of applicants were arranged alphabetically and approximately the last half of each list was selected for vaccination, the first half being held as controls.

The physicians had some hesitancy in administering the vaccine and an effort was made for one of us to be present with each physician to assist in his first inoculations.

With the announcement of the Greensboro study, Dr. Brodie, who coöperated fully not only in supplying the vaccine but in every other manner possible, simultaneously discontinued sending vaccine to North Carolina except at our direction. Requests received by him from individuals and physicians were submitted to us. The requests coming through him, and those received directly from physicians in other parts of the state, were numerous, and much pressure was exerted on us by some physicians for vaccine for their children. These were uniformly refused with the statement that vaccine used under our supervision would be used only in controlled studies. Where possible we visited localities from which many requests were received, and because of such requests Wilmington and Washington, N. C., with the coöperation of the Health Officers, Dr. A. H. Elliott and Dr. D. E. Ford, were later selected for study sites. These were the only places in North Carolina offering the opportunity for such study.

A number of communities in Virginia requested that they be selected as study sites. In 6 of these places the problem was discussed with the health officers and physicians and the decision was reached that it was too late to attempt any work. However, in Petersburg, arrangements were made with the physicians and the Health Officer, Dr. Mason Romaine.

The same general procedure followed in Greensboro was used in these areas except that, profiting by the Greensboro experience, a time limit of 1 week was set for listing names; the upper age limit was raised to 10 years in Petersburg; and the administration of the vaccine was demonstrated to physicians as a group rather than by giving assistance to each individually.

In the 4 localities, 1,452 individuals, representing 7.2 per cent of the population of the ages involved, requested vaccine, of whom 766 were selected by the method described to receive it, and 686 were held as controls. Of the 766 selected, only 458 reported

for inoculation, representing 2.3 per cent of the child population.

Various methods of inoculation and various inoculation sites were used by individual physicians. Dr. Brodie has recommended 1 to 2 c.c. given intracutaneously, and the remainder of a 5 c.c. dose subcutaneously at each of the two dates of injections given 14 days apart. For uniformity of dosage we recommended 1 c.c. intracutaneously and 4 c.c. subcutaneously.

To avoid pain from the injection of such a large volume of vaccine, prior use of 0.5 per cent to 1.0 per cent novocaine was at first recommended. This was given up because the increased quantity of material necessarily injected in a small area, and the extra introduction of the needle seemed to outweigh the advantages of the novocaine.

Following Dr. Brodie's advice, it was recommended to administer the second dose on the 14th day following the first. Of the 458 inoculated, 422 received 2 doses and 36 only 1. Of the 422 receiving 2 doses, 326 (77 per cent) had their second dose on the 14th day; 16 (3 per cent) less than 2 weeks from the first; 70 (17 per cent) in the 3rd week, and 10 (2 per cent) over 3 weeks following the first dose.

Of the total number inoculated, 1.3 per cent were under 1 year of age; 48.9 per cent 1–4 years, and 49.8 per cent 5–10 years of age. Negroes comprised 16 per cent of those receiving vaccine.

REACTIONS

Physicians administering the vaccine were requested to record all local and general reactions. However, to make the observations uniform we attempted to see the vaccinated children at about the time of the second dose and about 1 month following it. At these visits inquiry was made regarding reactions; the inoculation sites were examined where possible; and inquiry was made regarding symptoms which might have represented unrecognized abortive poliomyelitis. Such visits were completed in 88 per cent of the vaccinated. Inquiry was also made in 71 per cent of the controls as to symptoms which might have resulted from unrecognized abortive poliomyelitis. This was in addition to the routine reporting by the physicians of all cases of suspected poliomyelitis to the health officer.

It was found that such follow-up visits were necessary to secure an estimate of the reactions. Either because the physicians' findings were not recorded, or because they did not see the patients again after vaccination, many reactions were noted only by means of our follow-up visits. For example, there was no note on the physicians' cards of 6 of the 14 abscesses which occurred. It also developed that 3 children recorded as receiving the vaccine had not been inoculated and that 4 controls had been inoculated with no record of the vaccinations given us. (These and 6 other controls inoculated and recorded are not included in the study group.)

On the basis of our records in the 403 vaccinated seen by us, and the physicians' records in 55 cases not seen by us, 229 individuals (50 per cent) were found to have had local reactions consisting of one or more of the following conditions:

a. Redness and swelling 1 inch or more in diameter and lasting longer than 48 hours
b. Local pain lasting longer than 48 hours
c. Local suppuration or necrosis
d. Induration lasting 3 weeks or longer

In the Greensboro series, where reactions occurred more frequently than in the other areas, reactions followed 48 per cent (178 out of 374) of the inoculations preceded by novocaine and in only 17 per cent (11 out of 64) of those not preceded by novocaine.

No novocaine was used in the other localities.

In the 4 study areas, 458 individuals received 880 inoculations—458 first doses, and 422 second doses. Local reaction of some degree followed 24 per cent (110) of the first inoculations, and 43 per cent (181) of the second.

As a group, the reactions from the second dose were generally more severe than those from the first although the doses were the same in amount. There was no correlation between local or general reactions and the time interval between the 2 doses.

Two children who had had antirabies treatment in the summer of 1934 had no local or general reaction following the Brodie vaccine.

Of the local reactions recorded, only 15 were out of the ordinary. One of these was a fairly severe urticaria occurring around the site of the subcutaneous inoculation on the 7th day in a child with an allergic history. Ten were abscesses at the site of the subcutaneous inoculation that were opened surgically or opened spontaneously, and 4 were fluctuant masses 1 to 2 inches in diameter which had not opened. Most of the abscesses cleared up promptly following drainage and local treatment; however, several were very slow to heal, the area filling in with indolent granulation tissue. There were also 15 instances of superficial slough 3 to 5 mm. in diameter at the site of the intracutaneous inoculation.

General reactions following the vaccine were observed in 17 children (3.7 per cent) and in 4 of them were, at the time, very disturbing. Résumés of the histories of these 4 are as follows:

1. Within 30 seconds after the administration of her first dose, a white female, 2 years of age, fainted, became cyanotic, and stopped breathing. After 10 to 15 minutes of manual and mouth-to-mouth artificial respiration she recovered and suffered no further ill effects. She had no reaction following the second dose.

2. On the 3rd day after vaccination, a white female, 5 years of age, developed what was diagnosed as an acute inflammatory rheumatism of both knees. She had high fever for 3 days, and was confined to bed for 10 days. When seen 3 weeks following vaccination, her knees were still swollen but not tender, and the child was extremely weak and underweight. Seen again 7 weeks after inoculation she had gained weight and strength and suffered no apparent disability. The second dose was not given.

3. About 10 minutes after the first dose, a white male, 5 years of age, felt faint, nauseated and became very pale. He had a "medicine taste" in his mouth. After lying down 30 minutes he felt all right. His parents state he now has no appetite, has lost weight and strength, and appears anemic and listless. He was not given the second dose.

4. A white male, 6 years of age, complains of occasional cramping pain in the leg, the site of the second subcutaneous inoculation. One month after vaccination these cramps are less frequent and less severe but still occasionally present.

An additional 13 children had fever of 101–104° for 1 to 2 days and were listless. Several of them had headaches and were nauseated. In 10 of these the fever occurred in the first 3 days. In the other 3 it was associated with abscesses and subsided when they opened.

GENERAL DISCUSSION

The evaluation of the efficacy of a vaccine against poliomyelitis introduces problems peculiar to any disease carrying a low morbidity rate and factors inherent in human nature itself. The sample of the population tested must be adequate enough, in point of numbers, to satisfy elementary requirements of the theory of probability. It must also be a good sample—"fairly representative qualitatively of the universe from which it is drawn." To get a good sample is primarily and

fundamentally a biologic problem and one which may involve intangible elements not easily susceptible to statistical treatment. It is usually relatively simple to obtain a good sample in regard to such variables as age, sex, race, and geographic location, or it is possible to correct for any discrepancies in these factors which may develop. It is impossible to determine what selective influences make one individual apply for a vaccine and another not apply; and further impossible to know what effect these factors might have on the results.

For example, 1,452 persons applied for vaccine. Following the receipt of applications, 15 cases of poliomyelitis were reported in other children of the same age in the same communities. The rate these cases represent out of the total child population, applied to the 1,452 applicants, gives an expectancy of 1.09 ± 1.03 cases among those in the study group. In other words, one would have expected the chance occurrence of from 0 to 2 cases in the study group. Actually, no cases were reported. The figures are too small for much significance but they make one wonder if people who applied for vaccine in this series, regardless of whether they were vaccinated or not, were not somehow less likely to acquire poliomyelitis than other individuals in the same communities.

It is therefore also obvious that the sample of population vaccinated should be adequately controlled with an equally large group of unvaccinated. It is not enough to vaccinate all applicants and retain as controls other children in the same community who did not apply. The division of the applicants into vaccinated and controls must be impartial.

The adequacy of the sample, in point of numbers, to satisfy elementary requirements of the theory of probability is amenable to calculation. In North Carolina counties where the studies were carried out, assuming that the attack rate observed this summer (approximately 60 cases per 100,000 of the population under 8 years of age) prevailed in the controls, and that the vaccine was 100 per cent effective, a sample of 20,000 candidates—10,000 vaccinated and 10,000 controls—would have been necessary in order that the difference between the number of cases in the vaccinated and the number in the controls be relatively free from mere chance. With the same rate in controls, and the vaccine only 80 per cent effective, a sample of 40,000 candidates would have been necessary. Of course, the inclusion of individuals of older ages in the study group would tremendously increase the size of sample required because of the sharp decline in attack rate as age progresses. The above figures are also predicated on reported cases, about 15 per cent of which were abortive. For an unequivocal evaluation it would probably be more rational to use only paralytic cases because of diagnostic difficulties and because paralysis is, after all, what it is desired to prevent. The sample necessary would be increased if it were calculated on the basis of the paralytic rate.

Selection of vaccinated and controls by the method used in these studies is, so far as we are aware, open to only one serious scientific criticism. Of the 766 selected to receive vaccine, only 458 reported for inoculation. We have no way of knowing how many of the controls, had they been selected, would have refused the vaccine. It must be stated, however, that in any method of using arbitrarily selected human controls, constant vigilance and supervision by an impartial observer appears necessary. Methods of circumvention of the rules set down are numerous, and for adequate studies must be carefully guarded against.

It therefore appears that the considerations brought out in this study—psychologic, administrative, and scientific—present problems which in the aggregate make the unequivocal evaluation of the efficacy of a poliomyelitis vaccine a matter of extreme difficulty.

SUMMARY

1. The administrative procedures employed in conducting field trials of the Brodie poliomyelitis vaccine in North Carolina and Virginia during the summer of 1935 have been outlined.

2. In the 4 study areas, 1,452 applications for vaccine were received, of which 766 were selected for vaccination and 686 held as controls. Four hundred and fifty-eight of those selected were inoculated, 422 with 2 doses and 36 with 1 dose. In addition, 10 controls were known to have been inoculated. No cases of poliomyelitis were reported in any of the 1,452 candidates, and hence no conclusions concerning the efficacy of the vaccine can be reached from this study.

3. Local reactions occurred in 50 per cent of those inoculated but were not of serious import except in 3 per cent (14 abscesses).

4. General reactions were observed in 17 instances (3.7 per cent), 4 of which were temporarily very disturbing.

5. In an area where the controls were as much spared from epidemic prevalence as were the children of the North Carolina counties where these studies were carried out, and with all possible safeguards as to impartial division of applicants, 10,000 vaccinated children, together with 10,000 controls would have been necessary to show conclusively the value of a perfect vaccine against poliomyelitis.

If the vaccine were only 80 per cent effective, a total of 40,000 children would have been necessary.

ACKNOWLEDGMENTS—The coöperation of Dr. Park and Dr. Brodie, the State Health Departments of North Carolina and Virginia and the health officers, physicians and public of the study areas, is gratefully acknowledged. It is impossible for one not implicated to appreciate the difficulties imposed on the health officers and the private physicians coöperating in a study of this sort.

The general planning and supervision of these studies were under the direction of Dr. J. P. Leake, Medical Director, U. S. Public Health Service.

Rat Extermination

IT has been called to the attention of the *Journal* that—". . . two men, R. N. and H. A. Ferris, brothers, the former in the early 20's and the latter about 30 years of age, are apparently touring the country offering to put on campaigns of rat extermination. They carry with them credentials which appear to be authentic as well as newspaper clippings endorsing the work. Their method of procedure seems to be to establish an alliance of some kind with local health departments. The plan that they outline for their campaign of extermination as well as the materials used are above reproach and would probably win the endorsement of any health official. Unfortunately, however, after operating for a term of several weeks and making as many collections as possible, the gentlemen above mentioned seem to have developed a habit of disappearing without leaving a forwarding address. By accident the writer was able to uncover the home of these gentlemen and a registered letter with return receipt requested was addressed to one of them, requesting a statement as to their intentions for completing the work which they had undertaken locally. The receipt has returned, but to date no reply to the letter."

M. McC. F.

Active Immunization Against Poliomyelitis*

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FOR the past 5 years, we have carried out experiments with a view toward developing a safe and effective method of immunization against poliomyelitis. In this paper, we propose to give a report of our approach and to present the data collected up to the present time.

Using *Macacus rhesus* monkeys, three methods were tried. These included the use of sub-infective doses of active virus, virus-serum combinations, and germicidally inactivated virus.

The use of active virus was, as one would expect, the most effective, but it proved dangerous, for some of the animals developed the disease during the course of immunization. Since, neither in poliomyelitis nor in other virus diseases is there any evidence for the belief that the virus loses its infectivity for man through animal passage, it was not deemed advisable to try it in the human.

Virus-serum combinations produced immunity but were difficult to standardize.

Therefore, germicidally inactivated virus was resorted to, inasmuch as the experiences of Bedson [1] and others with the viruses of herpes, psittacosis, fowl-plague, foot and mouth disease, and rabies, indicated that after chemical treatment, immunization could be obtained with non-infective preparations, whereas heat killed material was ineffective.

In a recent article Flexner [2] maintained that there was no evidence to show that germicidally inactivated virus engendered immunity. However, he refers to experiments involving too few animals to be significant. Moreover, in that work no significance was attached to the importance of treating the virus so as to render it non-infective, but not overtreating it. In our work it was found, in both monkeys and children, that when formalin acts upon the virus for the minimum amount of time necessary to render it non-infective, the material is superior to virus that is overtreated. This is in keeping with similar findings by Bedson and others for foot and mouth virus.[3] In fact, as we will point out, storage for more than 2 to 3 weeks at icebox temperature, which allows overaction of the formalin, renders the vaccine non-antigenic. Moreover, with germicidally inactivated viruses, as has been shown by the work of MacKenzie [4] and others, it is necessary to use large doses. In both monkeys and humans we found this to be the case in immunization against poliomyelitis.

With freshly prepared material, inactivated for just the proper length

* Read at the Fourth Annual Meeting of the Southern Branch, American Public Health Association, in St. Louis, Mo., November 19, 1935.

of time, and given in large doses, we have been able to demonstrate serum antibody in monkeys. Likewise, both Olitzky[5] of the Rockefeller Institute, and Schultz[6] of Stanford University have reported antibody production in monkeys with formalized vaccine. They failed to demonstrate any resistance to intracerebral inoculation with their test, which was more severe than we used for the demonstration of tissue immunity. We have reported that even large amounts of active virus given to monkeys immunized them against only small or moderate intracerebral doses of virus. The method for demonstrating such a fine degree of immunity has been to carry out simultaneous titrations of the virus in a series of 8 monkeys, putting 2 animals on each of 4 doses. The immunized animals receive 1 to 3 times the smallest amount of virus that produces complete paralysis in both monkeys in the usual incubation period.

When serums are tested, the neutralizing power is estimated as the number of minimal completely paralyzing doses that the serum neutralizes—many times the smallest dose that brings down the controls. That such a method gives reasonable accuracy is indicated from the following results of titration:

During the time the monkey experimental work was being carried out, 94 animals were used in titrating the virus. Of 60 monkeys which received the minimal, or 2 to 4 times the minimal, completely paralyzing doses, 57 came down with complete paralysis in the usual incubation period. Only 2 of the other 34, which received less than the estimated infective dose of virus, succumbed to the disease.

During the past 16 months, because of the large number of monkeys used, it has not been possible to keep them for a long enough time prior to inoculation to get them on uniform rations and to weed out those with intercurrent infection. As a result, the virus titrations have not been so constant, and, to offset this, sera are tested prior to receiving vaccine on 5 to 10 infective doses respectively, and multiples thereof. After vaccination the sera are tested against 40 and 80 infective doses and multiples thereof. The test for antibody in humans, therefore, is sufficiently coarse to meet the criteria of antibody in the hands of others.

Like Flexner, who has pointed out that there is no evidence to believe that monkey passage virus is non-infective for man, we have felt the use of non-infective material the safest procedure and therefore worthy of extensive trial to determine whether or not whatever immunity it produced would be sufficient to protect children against the disease. The safety of the vaccine is indicated by the fact that intracerebral and intraperitoneal inoculations have failed to infect monkeys. In addition, the formalin in the concentration used renders non-infective choriomeningitis, herpes, and other viruses, and so should render inert any chance virus the monkey may carry. We realize that should active immunization protect against the disease, it will not completely solve the problem of poliomyelitis because of the difficulty of vaccinating so many in the absence of a susceptibility test. However, we do not agree with Aycock and others who maintain that the procedure is unwarranted because of the relatively small number of susceptible individuals. To maintain that infection with the virus of poliomyelitis is a question of susceptibility entirely, is an assumption, as we will point out later.

Those most likely to contract poliomyelitis are children below 10 years of age. The greatest incidence of the disease is in the 1–5 year group and in the 6–10 year old group, which is in keeping with the larger proportion in these groups who show no antibody,

and the low average level of such a group. This is indicated in Table I where the amount of antibody is designated as none, where the 0.9 c.c. of serum neutralizes less than 10 infective doses of virus, slight amounts, where it neutralizes 10–50 infective doses, which is probably an almost negligible amount, moderate, neutralizing 50–200 infective doses; and considerable amounts in which more than 200 infective doses are neutralized. Thus it would seem that the lack of antibody is a factor predisposing to the disease inasmuch as over 85 per cent of those under 5, and over 70 per cent of the 6–10 year old group show no antibody or only a small amount of antibody.

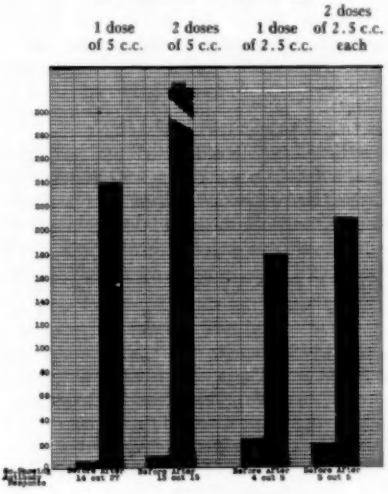
This does not explain why in an epidemic approximately only 1 of the 170 children under 5 showing no antibody, and about the same proportion of those under 10 develop the disease. This may be due to the individual non-specific variation in the susceptibility of the children, or the size of the infective dose, or number of exposures, or the accessibility of the virus to the olfactory fila.

Until these or other factors in the epidemiology of the disease are understood, then mass immunization, though wasteful, is a logical procedure.

IMMUNIZATION OF CHILDREN

This study consists of 2 parts, (1) the determination of antibody in approximately 150 children, and (2) field studies.

GRAPH I—Antibody Response to one and two doses—5 c.c. or 2.5 c.c.



ANTIBODY RESPONSES

These may be summarized as follows:

1. The immune response was proportional to the size of the dose tried for as Graph I indicates, with 5 c.c. doses the response was decidedly better than with 2.5 c.c. amounts.

2. As would be expected, where antibody was already present the response was decidedly better and in keeping with the amount of natural antibody present.

3. In the absence of any natural antibody, 60 to 65 per cent responded to a single, and nearly 90 per cent to 2 doses. Throughout, 2 doses gave a greater incidence, degree and duration of immunity than did 1 dose, as is indicated in Graphs I, II, III, and IV. In Graphs II and III are recorded the data collected from tests done on the serum of a small group of children at various intervals

TABLE I

NORMAL URBAN ADULTS

	No Antibody Neutralizes Less 10 M.C.P.	*Slight Antibody Neutralizes 10–50 M.C.P.*	*Moderate Antibody Neutralizes 60–200 M.C.P.*	*Considerable Antibody Neutralizes 200+ M.C.P.*	*Total*
6 mo.– 1 yr.	5	2			7
2 yr.– 5 yr.	54–62.8%	19–22.1%	11–12.8%	2– 2.3%	86
6 yr.–10 yr.	15–38.5%	13–33.3%	9–23.1%	2– 5.1%	39
11 yr.–17 yr.	0	1– 6.25%	5–31.25%	10–62.5%	16
Adults	1– 2.6%	2– 5.3%	6–16%	28–76%	37

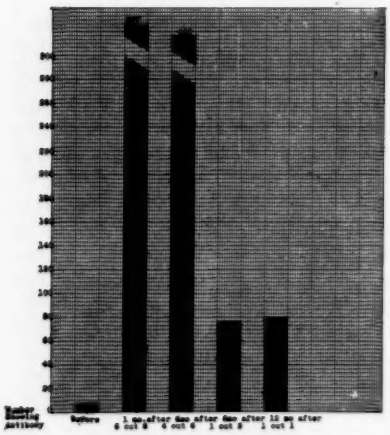
after immunization. The group which received a single dose responded exceedingly well, but the antibody fell off rather rapidly so that in several children it had almost completely disappeared in 5–8 months. Following the administration of 2 doses the antibody produced was still present at 5–8 months in all the individuals tested and could be demonstrated in 4 out of 6 tested 1 year after immunization. Where 1 dose failed, a second often produced a response as indicated in Graph IV, where after a single dose no antibody developed in a child, but after the second considerable antibody could be demonstrated. Similar findings were obtained in 6 out of 7 children. When the antibody disappeared after a single dose, it sometimes responded rapidly to a second dose. Three children from whose serum the antibody had disappeared within 6 months after the first dose were given a second dose, and a fourth child was given a second and third dose. All showed considerable antibody which persisted for a longer time than after the first inoculation.

Upon using brain stem as well as cord for preparation of the vaccine it was inactivated in a shorter period of time. Several series of children were given different batches of vaccine incubated with formalin for different periods. Although the groups were small, the results given in Graph V indicate that with the longer exposures to formalin less antibody develops.

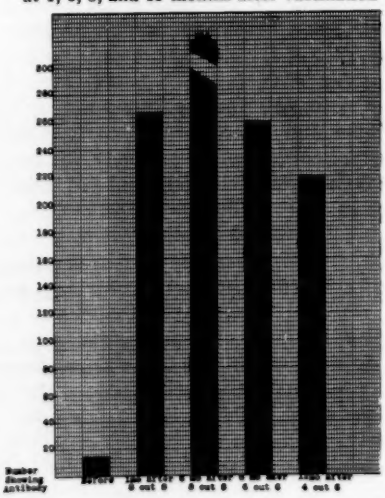
The vaccine does not keep well in storage. It was shown both in humans and monkeys that after storage for 1 month the vaccine produced but little antibody, and that after 2½ months at icebox temperature no antibody response could be demonstrated. It is interesting to note that at Seaview Hospital, New York, 1 of 4 children given vaccine which had been stored for 2½ months and who showed no antibody after immunization, contracted poliomyelitis. At this institution none of the 39 children given freshly prepared material developed the disease, whereas 1 of the non-vaccinated children came down.

Antibody can be demonstrated about 1 week after injection and reaches its height in 3 to 4 weeks. Therefore, no protection can be expected unless the person has received the vaccine at least 3 weeks prior to exposure. Thus, the

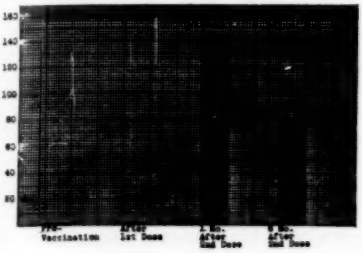
GRAPH II—Antibody Response—Single dose at 1, 6, 8, and 12 months after vaccination



GRAPH III—Antibody Response—Two doses at 1, 6, 8, and 12 months after vaccination



GRAPH IV—One Dose—No Response. A Second Dose—Antibody Response

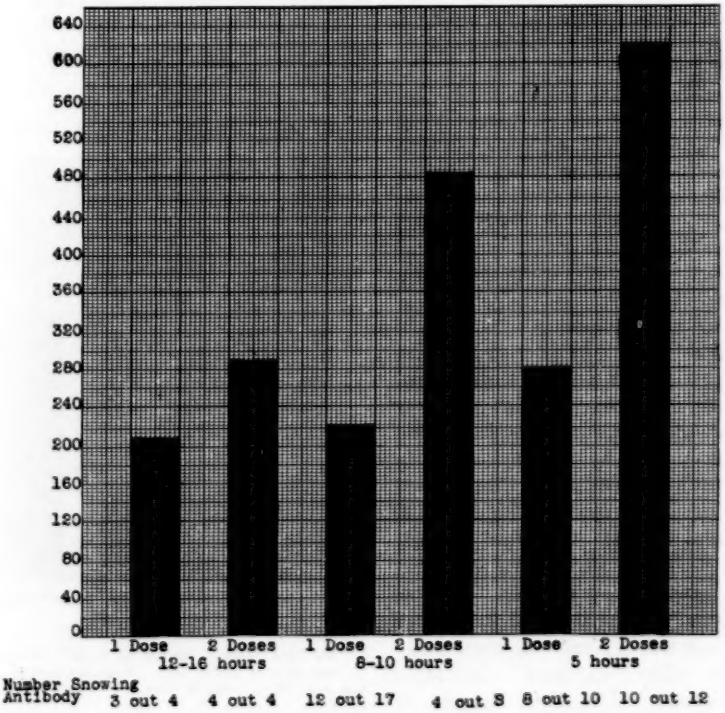


vaccine will be of no value where exposure has already taken place.

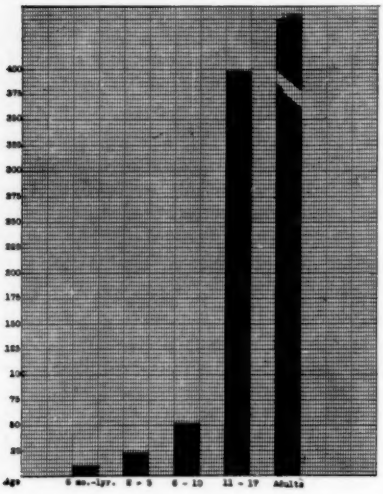
FIELD STUDIES

Up to the present more than 9,000 individuals have received vaccine. Inasmuch as more than 7,000 of these were in endemic or epidemic foci, it is quite likely that they were exposed to the virus. The control group, of non-vaccinated children consists of about 7,500. Of these approximately 4,500 were in exposed areas and can be compared with the similar group of 7,000 vaccinated. In so far as possible each vaccinated individual was matched with a control in the same district and of the same age. Wherever possible playmates were used. The details of the method of control have been discussed previously. Less than 1 per cent of those given the vaccine developed a general reaction. In cases where reaction did occur, it usually passed off in less than 24

GRAPH V—Antibody Response to Various Periods of Inactivation in Children with Little or No Pre-vaccinal Antibody



GRAPH VI—Antibody Levels in Normals



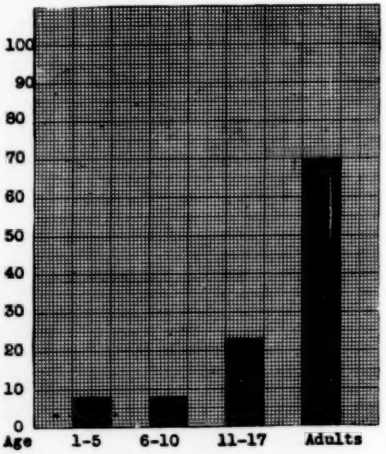
hours. About 2 per cent had local reactions such as induration and slight superficial necrosis, or occasionally a small abscess.

The vaccinated group included 564 individuals who were vaccinated after a definite history of exposure. Three of these developed the disease on the day of injection, and 1, 13 days later. The latter developed as a fulminating bulbar case. Inasmuch as it takes at least 3 weeks to obtain the full response from the vaccine, one cannot expect protection after exposure.

Of those vaccinated prior to exposure the largest groups were in North Carolina; Kern County, Calif.; and at the Los Angeles County hospital. The first group will be reported upon in detail by Dr. Gilliam. The second group has been reported on by Drs. Joe Smith and M. A. Gifford in their annual report, at which time somewhat over 3,000 had received vaccine. Nearly an additional 1,000 have since been injected. None of those vaccinated after exposure contracted the disease.* Dr. Emil Bogen, in reviewing the statistical data, states that, judging from the general incidence of the disease, one would have expected 3 to 5 cases to occur in the vaccinated group. In the town of Taft, where 652 were vaccinated and controls set up, 2 in the control group contracted the disease. Of the 200 on the staff of the Kern County hospital who received the vaccine, none contracted the disease, although the incidence was high among attendants of neighboring hospitals, such as those of Los Angeles County, Orange County, and Fresno County. Since all of the hospital staff were vaccinated, there were no controls for evaluating the vaccine.

At the Los Angeles County Hospital, where more than 300 nurses and physicians were vaccinated, Dr. Kessel reported that in one group of 42 vaccinated (15 received Kolmer vaccine) none came down with the disease, whereas 3 of the control group of 50 contracted poliomyelitis.

GRAPH VII—Antibody Levels in Poliomyelitis



* We have recently learned of a case developing 13 days after a single dose. A similar second case has only been reported, but the diagnosis is not certain.

DISCUSSION

These studies have brought out the fact that a formalized vaccine produces some antibody in both monkeys and humans. That antibody is an indication of some real immunity is based upon the following evidence:

1. In keeping with the findings of others, we have shown that the incidence and degree of antibody (Table I, Graph VI) increases with age, which correlate with the lower incidence of the disease in the higher age groups, so it would appear that the presence of this antibody is a factor in protecting older children and adults from the disease.

2. In comparing the immunity developed after the injection of active virus with that following the administration of formalized virus, it was found that with living virus the degree of both tissue and humoral immunity was higher.

3. The antibody content of a group of paralytic poliomyelitis cases was tested during the first week of the disease and compared with that in normal individuals. The presence and amount of antibody were compared for different age groups. It was found in the small group tested that persons with acute poliomyelitis usually had little or no antibody. Inasmuch as the level of antibody seems decidedly lower in poliomyelitis than in so-called normal individuals, as demonstrated in Graphs VI and VII, we feel that the lack of specific antiviral substance is one of the determining factors that predisposes individuals to poliomyelitis.

When the virus enters the nose, the antibody present in the nasal secretions, if in sufficient quantity, may neutralize the virus. Should this, the first line of defense, fail, then the virus can get to the central nervous system, where it may or may not multiply, depending upon the resistance of the cerebrospinal axis.

The combined humoral and tissue immunity of children can be tested only in following up the outcome of natural exposure. Up to the present, none * of nearly 7,000 who were probably exposed, after vaccination with fresh vaccine was completed, have contracted the disease, whereas 5 of a smaller control group have come down.

The field trials must continue on a still larger scale to give the final answer. We feel that further work in this direction is merited because:

1. The vaccine is non-infective upon intracerebral inoculation into monkeys and from all experiences to date appears to be harmless.

2. Some immunity is developed and although evidenced only as antibody production, we have indicated its importance in the mechanics of protection.

3. Immunization against other virus diseases such as rabies, encephalomyelitis and louping-ill, has been obtained under field conditions with similar types of vaccine.

CONCLUSIONS

A formalized poliomyelitis vaccine which fails to infect monkeys after intracerebral inoculation and so probably is safe, stimulates antibody.

The present inadequate data have been favorable, and do not show that the vaccine does not immunize.

Field studies on at least 50,000 more children should continue in order to reach a positive evaluation.

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* We have recently learned of a case developing 13 days after a single dose. A similar second case has only been reported, but the diagnosis is not certain.

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Vaccination Against Acute Anterior Poliomyelitis*

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BEING convinced by reasons fully discussed elsewhere [1] that effective vaccination against acute anterior poliomyelitis requires the administration of active virus, I have employed as a vaccine for the immunization of monkeys and human beings a 4 per cent remote monkey passage virus treated with 1 per cent sterile solution of sodium ricinoleate.[2] This concentration of sodium ricinoleate, however, being very low in bacteriostatic and bactericidal activity, did not prevent the accidental contamination with *B. coli* and a staphylococcus of 3 lots of vaccine prepared in the Research Institute of Cutaneous Medicine, so that the method of preparation was later changed to include 1:80,000 phenyl-mercuri-nitrate. This was found sufficient for protection against contamination during the preparation and administration of the vaccine without producing any material reduction in its immunizing properties.[3]

Since I believe that the method of preparation bears an important relation to the safety of the vaccine for both monkeys and human beings, it may be well to state that it is prepared of spinal cords from paralyzed monkeys following intracerebral inoculation with a remote passage virus. The cords are first kept in 50 per cent glycerol for at least a week, and then *very finely divided* in order to permit thorough mixture of the virus with the sodium ricinoleate and phenyl-mercuri-nitrate at 37° C. for 24 hours, followed by 10 to 14 days in a refrigerator at 10° to 12° C., with daily shaking, when cultural and mouse inoculation tests for sterility are conducted. The brain and cord of each monkey are tested in the meantime for the virus of lymphocytic chorio-meningitis (Armstrong) by intracerebral inoculation of mice which has not been encountered in a single animal.

ATTENUATION OF VIRUS AND OTHER FACTORS OF SAFETY

I believe that the virus in vaccines prepared in this manner has undergone some reduction in virulence or infectivity, which I first designated as devitalization and later as attenuation, but still retains some active virus. As a rule, the intracerebral inoculation of young monkeys with 0.3 c.c. of vaccine has produced some paralysis within 3 weeks and usually within 12 days, but not infrequently this appears more slowly and less severely than when monkeys of approximately the same weight and age are inoculated intracerebrally with 0.3 c.c. of a 4 per cent suspension of fresh untreated virus. The age and weight of *Macacus rhesus* monkeys have been found to have an important influence upon susceptibility,

* Read at the Fourth Annual Meeting of the Southern Branch, American Public Health Association, in St. Louis, Mo., November 19, 1935.

but it has been very difficult to gauge the degree of attenuation of virus by this means.

However, and more important, none of a series of 42 monkeys receiving the vaccine in doses as large as 0.5 c.c. per kg. (corresponding to as much as 5 c.c. for a child of approximately 25 lb.) every 5 days in 5 subcutaneous injections has developed any evidences of poliomyelitic infection, whereas in a control series of 20 monkeys receiving 5 similar doses of fresh untreated virus paralysis developed in 1. Under the circumstances I believe that the manner of preparing the vaccine has resulted in some reduction of infectivity of the virus. This is not due to a mere dilution of the virus, as the amount administered has been the same; but it may be a quantitative change in the sense that the method of preparing the vaccine may result in the inactivation of some of the virus. Nor can it be stated that the reduction in virulence of the virus by treatment with sodium ricinoleate and phenyl-mercuri-nitrate is permanent, as the virus recovered from the cords of monkeys paralyzed by intracerebral injections of the vaccine has usually been found apparently as virulent as untreated virus.

Therefore I think it is better to speak of the effects of sodium ricinoleate and phenyl-mercuri-nitrate upon the virus as being one of slight devitalization or attenuation, although I believe it is a reasonable assumption that some mutation of the virus for human beings may have resulted from the very large number of times in which it has been passed through monkeys. This, of course, has not been proved as it would require the subcutaneous injection of susceptible human beings with fresh unchanged virus, but the probability and possibility exist. Furthermore, while it is possible to produce paralysis of monkeys by intracerebral inoculation with human spinal cord virus, yet this is by no means easily accomplished, indicating that human virus usually requires some adaptation to the monkey before uniformly successful infection can be accomplished. It would appear that Dr. William H. Park shares this opinion, judging from his recent statement [4]:

> It is also known that it is difficult to adapt the human virus of infantile paralysis to monkeys so that they will develop an attack. The reverse of this is probably true: that a virus adapted to infect monkeys has lost much of its virulence for man.

Furthermore, it appears that the subcutaneous route of administration of the vaccine is an additional factor of safety. As stated, none of 42 monkeys receiving the vaccine by this route in relatively large doses has developed evidences of infection, and only 1 in a series of 20 receiving fresh untreated virus, even though the latter has been well adapted to this animal, nor have I been successful in infecting monkeys with human virus by this route although I hasten to add that it has been attempted with the virus from but 5 human spinal cords. I may state that the results of unpublished experiments indicate that it is even more difficult to infect monkeys with intracutaneous injections of passage virus; but I believe the results with subcutaneous injections justify the assumption that this route of administration is not favorable to infection. This opinion is also apparently shared by Dr. Park who has recently stated [4]:

> It is known that when intradermal or subcutaneous methods of injection are used, it is difficult to infect monkeys. There is every reason to believe that this is true of children.

Additional factors of safety in the subcutaneous or intracutaneous administration of the vaccine may be our custom of giving 3 small doses and the rapidity with which neutralizing antibody is apparently produced in some

children [5] and immunity in some monkeys.[6] I am perfectly aware that the amounts of vaccine advised for the immunization of human beings are less than found necessary for monkeys, but I have thought it likely that children will require much less immunization for protection against chance natural infection from contact with carriers or cases of infantile paralysis than is required for the protection of monkeys inoculated by the intracerebral injection of 10 or more minimal infective doses of virus.

It is for these reasons that I have regarded the vaccine as safe for the immunization of human beings when prepared exactly as described.[3] Certainly we have had no success in the immunization of monkeys with vaccines of virus "killed" or inactivated by heat, chloroform, phenol, or formalin. For this reason I believe that effective vaccination requires the presence of some active virus in the vaccine, and in this connection may state that on one occasion we found our vaccine ineffective in the immunization of monkeys when devitalization of the virus was carried out to the point where the intracerebral inoculation of 5 monkeys with 0.3 c.c. produced only mild paralysis of one arm of one of the animals. Why the presence of active virus is apparently required is discussed elsewhere in more detail,[1] but I may mention here that effective immunization in virus diseases may require the prolonged or persistent sojourn of the viruses in the hosts as stated by Rivers,[7] and if this is true of poliomyelitis, it is not unlikely that completely inactivated vaccines cannot produce effective and durable immunity in this disease.

DISTRIBUTION AND ADMINISTRATION OF THE VACCINE

Following our initial immunization of 2 adults and a group of 25 children varying in age from 8 months to 15 years, with absolutely no ill effects,[5] we have during the past 9 months administered the usual 3 doses to 446 additional individuals in Philadelphia,* 319 of whom were children from 6 months to 15 years of age, with no ill effects aside from some local reactions. In this connection I may state that the number of reported cases of poliomyelitis in Philadelphia during this period has been but slightly above the normal rate, which fact I mention because the low rate greatly reduced the chances of giving the vaccine during the incubation period at a time too late to prevent the disease.

Since April the Research Institute of Cutaneous Medicine has distributed 13,112 c.c. of the vaccine to 582 physicians in 36 states, including Canada, mostly in the epidemic areas, and the William S. Merrell Company of Cincinnati have distributed an additional 8,910 c.c. to 137 physicians in the same areas. These amounts, totalling 22,022 c.c. distributed through 719 physicians, have been sufficient for the immunization of over 12,000 individuals (mostly children). Reports have been received up to the present covering the immunization of 8,272 receiving Research Institute vaccine, and 2,007 receiving the Merrell vaccine, a total of 10,725 individuals, including the Philadelphia group, receiving the vaccine divided according to age as follows:

Under 4 years of age, 3,307 or 30.8%
4 to 15 years of age, 6,425 or 60.0%
Over 15 years of age, 993 or 9.2%

REACTIONS

With sterile vaccine, and especially that prepared with the addition of 1:80,000 phenyl-mercuri-nitrate, about 91 per cent had no local reactions aside

* I am indebted to Dr. George F. Klugh, Jr., and Dr. Robert Glenn for assistance in the immunization of these individuals in the clinic established at Temple University Hospital, January 26, 1935.

from slight stinging pain immediately after injection, followed by very slight tenderness for a day or two. In about 9 per cent the local reactions have been comparable to those produced by injections of diphtheria toxoid. Older children and adults have had more reactions than young children. Among the children receiving the 3 contaminated lots of vaccine from the Research Institute of Cutaneous Medicine, abscesses with constitutional symptoms developed in 26, who promptly recovered after drainage. There have been no severe local or constitutional reactions and no abscesses following the injection of vaccine carrying the 1:80,000 dilution of phenyl-mercuri-nitrate.

Constitutional reactions of slight fever, malaise, headache, some muscle stiffness, and anorexia with slight leukocytosis, subsiding in 24 to 48 hours, occurred in approximately 1 to 2 per cent of those inoculated with sterile vaccine. While skin tests on a small group of normal adults and children [8] have shown no evidences of a natural allergic sensitization to monkey spinal cord protein, there has been 1 case of allergic asthma reported to me following the administration of the vaccine, and a second patient in our clinic developed a mild urticaria following its administration. There have been no instances of demyelinization encephalomeningitis, such as have been reported in connection with the administration of rabies vaccine and regarded by some investigators as due to acquired allergic sensitization to spinal cord substance.

No instances of lymphocytic choriomeningitis have been reported to me following the administration of the vaccine, and we have not yet encountered the virus in the brains or spinal cords of our poliomyelitic monkeys by intracerebral inoculation of mice.

Since the vaccine has been given so extensively and with no restrictions whatsoever in the epidemic areas with consequently greatly increased chances of its administration to individuals during the incubation period, I have always expected that there would be at least some cases of poliomyelitis receiving the vaccine too late to prevent the disease. This possibility and probability were particularly impressed upon me by the fact that the great majority of individuals are apparently infected not by contact with actual cases but by carriers in which the duration of the primary incubation is in truth unknown and likely to be quite variable. Among approximately 11,000 immunized individuals, poliomyelitis developed in 10 who had received 1 or 2 doses of vaccine furnished by the Research Institute of Cutaneous Medicine. In at least some of these, it is a reasonable assumption that the vaccine was not responsible for the attacks, and in no instance has poliomyelitis developed after the full 3 doses of vaccine had been given. The essential facts of these 10 cases are as follows:

ABSTRACTS OF 10 CASES DEVELOPING POLIOMYELITIS

Case 1—The first instance reported to me by Dr. F. Kessel, of Los Angeles, was an adult exposed to the disease, who received 0.5 c.c. of the vaccine 4 days before the onset of a mild attack, exhibiting weakness in both legs and arms. It was obvious that this attack could not be ascribed to the vaccine, and this same lot was administered by Dr. Kessel to 82 additional individuals as well as to 310 (mostly children) in the southern states and our clinic, with no instances of poliomyelitis infection.

The next 2 cases occurred in the practice of Dr. Arthur Heyman of Newark, N. J., where a number of cases of poliomyelitis occurred during the past summer.

Case 2—Sally G., age 5¼ years. On July 5 and 11, the vaccine was given subcutaneously in alternate arms with practically no local or general reactions. July 13, very

transient pain in the back of the neck; July 14, some irritability; July 15, fever, frontal headache, neck stiffness, and vomiting; July 17, stiffness of the neck, with positive Kernig and Brudjinski reflexes; a spinal fluid examination showed a pleocytosis of 260 cells per c.mm.; July 19, flaccid paralysis of the left arm followed by improvement.

If the symptoms presented on July 13 were those of poliomyelitis, as appears probable, the attack began 8 days after the first, or 2 days after the second dose of vaccine. Dr. Heyman did not ascribe the attack to the vaccine, and thought that the two injections may have aided in confining the poliomyelitis to the mild and localized paralysis which in his experience was unusual in a case presenting so much constitutional reaction. The parents insisted upon the immunization of another child in this family.

Case 3—Victor P., age 8½ years. August 7, symptoms of an upper respiratory infection with malaise, irritability, etc.; August 10, given a subcutaneous injection of 0.25 c.c. of vaccine in left arm; August 11 to August 16, mild fever with persistence of upper respiratory symptoms; August 18, some tenderness in right deltoid muscle but no paresis or paralysis when examined by Dr. Danzis; August 27, weakness of the right deltoid muscle. No spinal fluid examination.

Dr. Heyman thought it possible that this child may have had the premonitory symptoms of poliomyelitis on August 7 before the vaccine had been given and that indeed its administration may have aided in rendering the attack very mild. He suspected that infection may have taken place in a swimming pool, as another unvaccinated child developed a severe bulbar type of poliomyelitis apparently from the same source at the same time.

Dr. Heyman gave the same lots of vaccine to 30 additional children under 4 years of age, to 42 between 5 and 15 years, and to 1 over 15 years of age with no evidence of poliomyelitis infection. Both lots were also given to 3 children by Dr. M. G. Dubois, to 5 by Dr. J. B. Rothstein, to 8 by Dr. S. B. Rawitz, to 4 by Dr. G. A. Holland, to 5 by Dr. Harry A. Brotman, to 59 by Dr. A. S. Finkelstein, and to 12 by Dr. R. N. Shapiro, all of Newark, N. J. Of 189 individuals, 54 were children under 4 years of age. The same vaccine was also given to 280 additional children in the southern epidemic areas and my clinic in Philadelphia with no ill effects.

Curiously enough, the next 3 cases also occurred in this same area in the practice of Dr. Richard C. Peters of Plainfield, N. J.:

Case 4—David C., age 10 years. August 24 and August 31, subcutaneous injections of vaccine in the left arm; September 3, developed headache with pain in neck and spine with fever, nausea and vomiting; September 4, rigidity of neck and spine with tremor of both arms. A spinal fluid examination showed 450 cells per c.mm. with a slight increase of protein. At this time 20 c.c. of convalescent immune serum were administered. September 5, flaccid paralysis of right arm followed by death on September 6. No autopsy was conducted.

Case 5—Hugh McD., age 5 years. August 4, first dose of vaccine by subcutaneous injection in left arm; August 31, second dose in left arm; September 6, slight fever and vomiting. An examination of the spinal fluid showed 250 cells per c.mm. September 7, paralysis of legs and arms with death September 9. No autopsy was conducted.

Case 6—Esther P., age 22 months. August 24, first dose of vaccine by subcutaneous injection in left arm; September 5, second dose in left arm; September 11, developed fever, headache, and vomiting, with stiffness of the spine. A spinal fluid examination showed the presence of 760 cells per c.mm. with a slight increase of protein. A transfusion of 350 c.c. of blood from a convalescent case was given, followed by 40 c.c. of convalescent immune serum on September 12; September 14, paralysis of left leg and both arms, ending fatally September 16. No autopsy.

Dr. Peters had given the same vaccine to 49 additional children, 29 of whom were under 4 years of age; Dr. L. D. Williams to 50 children, 15 of whom were under 4 years of age; and Dr. F. W. Lathrop, all of the same city,

to 4 children without any ill effects aside from some local reactions. The same lots were also administered to 262 individuals (mostly children) in other epidemic areas, and to 59 children in our clinic with no ill effects aside from some local reactions.

Case 7—A boy 5 years of age in the practice of Dr. M. W. Sinclair, Bluefield, W. Va. August 20, 0.25 c.c. of vaccine by subcutaneous injection in an arm; August 27, 0.5 c.c. of vaccine by subcutaneous injection in an arm; August 30, headache and vomiting; August 31, tenderness of neck and back with rigidity. Spinal fluid examination showed 648 cells per c.mm. with slight increase of globulin. September 1, paralysis of diaphragm and death. No autopsy.

Case 8—A girl 6 years of age in the practice of Dr. Sinclair. August 20, 0.25 c.c. of vaccine by subcutaneous injection in an arm; August 27, 0.7 c.c. of vaccine by subcutaneous injection in an arm. On September 3, she became acutely ill with poliomyelitis, developing paralysis of the left arm September 6, of the right arm September 8, and of the left leg September 9; September 11, she rapidly improved, talked freely, moved both arms and legs, and has since greatly improved.

Dr. Sinclair had 2 cases of poliomyelitis and 21 additional cases with positive spinal fluid changes, which were either abortive types of poliomyelitis or instances of lymphocytic chorio-meningitis, among unvaccinated children. He gave the same vaccine to 14 additional children with absolutely no ill effects other than very mild local reactions. The lot of vaccine used by him was also given to 93 children, 28 of whom were under 4 years of age, by Dr. R. R. Stuart; to 66 children, 19 of whom were under 4 years of age, and 4 adults by Dr. F. N. Andrews; and to 123 children, 23 of whom were under 4 years of age, and 11 adults by Dr. H. R. Connell, all of Bluefield, as well as to 222 additional individuals (mostly children) in other epidemic areas and in our Philadelphia clinic, with no ill effects. In Case 8 the sudden improvement of the child on September 11, followed by very satisfactory recovery, again suggests that the two doses of vaccine may have contributed to recovery possibly by aiding in the production of antibody.

Case 9—Marie De W., age 8 years; Dr. John M. Higgins, Sayre, Pa. September 8, 0.25 c.c. of vaccine by subcutaneous injection in left arm; September 15, 0.5 c.c. in left arm; September 16, nausea with some pain in the neck; September 17, nausea, vomiting and some pain in the neck; September 18, fever, hypersensitiveness and some abdominal discomfort. Reflexes normal. Later evidences of respiratory paralysis with death on September 19. No autopsy.

Three other children of the same family, 5, 9, and 11 years respectively, were also given the same vaccine with temporary systemic reactions but no other ill effects, and 3 additional children, 5 to 13 years of age, and 6 adults were inoculated with vaccine during the same period with no ill effects. Three doses of the same lot were also given at weekly intervals to 446 individuals (mostly children) in other areas, as well as to 62 children in our clinic, with no ill effects. Through the kindness of Dr. S. D. Conklin, of Sayre, I was able to examine the balance of vaccine in the vial employed in Case 9 and found it sterile upon culture. The intracerebral inoculation of a monkey with 0.3 c.c. produced paralysis 14 days later, but a second animal receiving 5 subcutaneous injections of 0.5 c.c. per kg. every 5 days (corresponding to about 10 c.c. per 50 lb. of weight) were without any ill effects whatsoever.

Case 10—Billy P., age 4 years; Dr. Walter Freeman, Washington, D. C. September 6, 0.25 c.c. of vaccine by subcutaneous injection in the left thigh; September 13, 0.5 c.c. of vaccine in the left thigh; September 14, fever, vomiting, restlessness and pain in the back of the neck; September 17, weakness of the extensor muscles of the right leg, loss of patellar and achilles reflexes, slight fever; September 20, improvement; Novem-

ber 8, striking improvement with almost complete recovery.

This child was in Elizabeth City, N. C., from August 31 to September 3, where, I am informed, there were no reported cases of poliomyelitis. Maids in the family were in a locality of the same state where some cases had occurred. The father, Dr. Matthew W. Perry, was in contact with a case on September 4. Dr. Perry had given the vaccine to Mrs. Perry and his two other children at the same time with no ill effects. Dr. Freeman also gave the same vaccine to 8 additional children, 3 of whom were under 4 years of age, and 2 adults, with no ill effects aside from mild local reactions. The same lot of vaccine was also given to 190 additional individuals (mostly children) in other areas, and to 19 in our clinic, with no ill effects aside from some mild local reactions. On November 8, Dr. Perry kindly wrote me that since the vaccine was given in the left thigh with the onset of the paralysis in the right leg only about 8 days after the first dose, both he and Dr. Leake did not believe that the vaccine was responsible.

It is of course difficult to interpret accurately the etiology of these 10 cases of poliomyelitis occurring among over 10,725 immunized individuals, 90.8 per cent of whom were under 15 years of age, since it is impossible to prove definitely or disprove that they were caused by the vaccine. If due to the vaccine, it is difficult to understand why there were not more cases since the particular lots administered had been given to at least 2,544 individuals, the majority of whom were children in the ages of greatest susceptibility. None of the vaccines were prepared of individual monkey spinal cords but were mixtures of four or more.

Furthermore, the duration of the period of incubation of poliomyelitis in human beings cannot be definitely stated, as one never knows when infection is contracted from a carrier or an abortive case of the disease. Indeed one of its greatest mysteries is the frequency with which isolated cases develop without any possible way of knowing or ascertaining the source of infection. It is commonly stated, however, that the period of incubation is from 1 to several weeks. Six of these 10 cases (Nos. 1, 2, 3, 8, 9, and 10) developed poliomyelitis 8 days or less after the first dose of vaccine, while the others (Nos. 4, 5, 6, and 7) did so in from 3 to 6 days after the second. Under the circumstances I believe it is a reasonable assumption that some at least were in the incubation period of the disease when the vaccine was given and especially since 8 occurred in areas where possible infection with the virus was increased.

It may be stated that the vaccine produced these attacks in individuals of unusually low resistance. I know of no way of proving or disproving such an assumption. Excluding the first case, in an adult where the vaccine could not possibly be regarded as the cause, 2 occurred in children 4 years or younger (Nos. 6 and 10), and the remaining 7 in children from 5 to 10 years of age where resistance is usually higher, since a larger percentage of this age group are known to carry neutralizing antibody in the blood.

It might also be assumed that the vaccine is capable of producing a negative phase of temporarily lowered resistance in some individuals, as is believed may follow the administration of any vaccine. I have not been able to elicit any evidence of this in the experimental disease of monkeys, although it may possibly occur in some human beings despite the fact that the doses are small. If such occurred, however, in unusually susceptible children receiving the vaccine during the incubation period of poliomyelitis, it may

readily result in a severer type of the disease, and this may have occurred in Cases 4, 5, 6, 7, and 9. On the other hand, if Case 3 was in the early stage of poliomyelitis when the vaccine was given, there were certainly no evidences of a negative phase having been produced since the attack was so mild.

However, I am now particularly interested in the intracutaneous injection of the vaccine because preliminary results indicate that much smaller doses may give an equally good or even better immunity response than subcutaneous injection, with possibly much less chance of producing periods of temporarily lowered resistance. And in this connection the recently published work of Rivers and Ward [9] upon intracutaneous injections of culture vaccine virus for immunization against smallpox has renewed our interest in the possibilities of the intradermal use of poliomyelitis vaccine.

Furthermore, the intracutaneous injection of the vaccine may greatly reduce the chances of the virus in the vaccine being conducted to the spinal cord by way of the peripheral nerves or lymphatics, although it does not appear from the 10 cases herein reported that this is at all likely to occur from subcutaneous injections. In Cases 3 and 4, for example, the vaccine was injected in the left arms but mild paralysis developed in the right arms; in case 10 the vaccine was given in the left thigh with paralysis developing in the right leg; while in Cases 1, 6, and 8, paralysis also developed in the legs although the vaccine was given in the arms.

I do not wish to be understood as merely seeking reasons for excusing the vaccine as a possible cause of these 10 cases of poliomyelitis occurring among 10,725 and more inoculated persons; but if the vaccine were primarily responsible, I find it difficult to understand why there were not many more cases among the 2,544 inoculated with the same lots and particularly since 30 per cent of the whole, or 3,307, were children under 4 years of age and therefore in the period of greatest susceptibility. Furthermore, it is not without significance that no one receiving the full 3 doses has contracted the disease. Under the circumstances, I do not personally believe that the vaccine was responsible for all of these cases although I think it is possible that its administration to unusually susceptible children during the incubation period may enhance the severity of the disease by the production of a negative phase, and especially during epidemics when the virulence of human virus is probably increased.

IMMUNIZING VALUE

It is of course too early to express a definite opinion of the immunizing value of the vaccine except to mention again that no one receiving the full 3 doses has contracted poliomyelitis. Only the lapse of many years will eventually reveal whether or not any immunized individuals develop the disease. In this connection I very carefully considered the manner of distributing the vaccine for the purpose of securing the best possible check-up and adequate controls, and finally decided that since we were financially unable to establish social service departments for follow-up work, this could be best handled through individual physicians keeping the addresses of immunized persons and using the much larger group of unvaccinated individuals in each community as controls. After all, and in the final analysis, it is essentially a matter for determining whether or not any vaccinated persons, especially children, develop the disease during the present epidemic or in the future, and this demands the immunization of as many as possible with subsequent observations over years, which I finally

decided could be best done through individual physicians.

It is true that additional data of some scientific value may be obtained by conducting monkey serum neutralization tests before and after immunization to determine the number responding with the production of neutralizing antibody. Unfortunately, since our work was financed and made possible only by voluntary contributions from physicians, we were not able to conduct as many of these tests as we had hoped. It would appear, however, that enough may have been conducted to indicate that neutralizing antibody is produced in over 80 per cent of vaccinated individuals, but it remains to be seen whether or not this is adequate for effectual resistance to the disease. I have reason to believe [1] that the antibody produced in human beings by active remote monkey passage virus is capable of neutralizing human virus, and under the circumstances I believe one can reasonably assume and expect that it will afford a state of resistance to infection. Furthermore, since there is apparently in poliomyelitis an important tissue immunity,[1] it is not unlikely that the vaccine may produce a type of immunity not to be measured or ascertained by monkey serum neutralization tests. This is conjectural only, and awaits final elucidation by the passing of years, with follow-up observations on a very large group of vaccinated individuals and particularly young children.

I am confident that the vaccine prepared exactly as described so as to contain at least some active virus is capable of immunizing monkeys and the production of the immune state in these animals was always determined by injecting them intracerebrally with 5 or more minimal infective doses of virus. Unfortunately we were unable to finance neutralization tests with the sera of these monkeys before and after immunization, so that I am unable to discuss the relation or lack of relation of neutralizing antibody to resistance in these animals; but, after all, the results of intracerebral tests would appear to be the better criterion when controlled by the intracerebral inoculation of an adequate number of unvaccinated animals, as we were fortunately able to do.

From the fact that the vaccine is capable of successfully and effectively immunizing monkeys, and since it has produced neutralizing antibody in children capable of neutralizing human virus in about the third monkey transfer, I am reasonably confident that the vaccine is capable of effectively immunizing human beings against the disease.

It is, however, still too early to express an opinion on the probable duration of this induced immunity except to state that 3 monkeys have maintained a solid immunity for 3 years. I have now discarded the animals, because their age may alone account for at least a part of this resistant state to intracerebral inoculations with virus, and for this reason further tests would appear to have but little scientific value. It is not without significance and encouragement, however, that monkey neutralization tests with the sera of 23 out of the original group of 25 children [5] immunized 11 months previously, have shown the persistence of antibody in all who showed its presence when tested 1 week after the third dose. Indeed, one child without demonstrable amounts of antibody in tests conducted at that time showed its presence in these repeat tests conducted this year. I believe therefore that the immunity produced by the vaccine is an enduring one, and if it lasts only a sufficient number of years to protect children over their age of greatest

susceptibility until the natural immunity of maturity has been reached, it seems well worth while.

SUMMARY

1. It would appear that effective vaccination against acute anterior poliomyelitis requires the administration of active virus.

2. Treatment of remote monkey passage virus with sodium ricinoleate and phenylmercuri-nitrate by the method described has resulted in sufficient attenuation to render the vaccine safe for the vaccination of monkeys.

3. The injection of such vaccine subcutaneously also appears to be an important additional factor of safety.

4. It is suggested that the remote monkey passage virus employed in the preparation of the vaccine may have lost some infectivity for human beings by the subcutaneous route of administration.

5. The amounts of vaccine employed for the immunization of human beings has been less per body weight than used for the immunization of monkeys because it is believed that less immunity will be required for adequate protection against natural infection with human virus.

6. The vaccine has been employed in the immunization of 10,725 individuals mostly in epidemic areas. Of these 3,307 (30.8 per cent) were under 4 years of age; 6,425 (60 per cent) between 5 and 15 years; and 993 (9.2 per cent) over 15 years.

7. With sterile vaccine local reactions at the sites of inoculation occurred in about 9 per cent with constitutional reactions in from 1 to 2 per cent.

8. There is no evidence of the vaccine having produced lymphocytic chorio-meningitis or demyelinization encephalo-meningitis.

9. No individual who received the full 3 doses has developed poliomyelitis. Among the 10,725 inoculated individuals there were 10 cases of poliomyelitis following 1 or 2 doses. Two were 4 years old or younger; 7 were between 5 and 10 years; and 1 was an adult. The same lots administered to these individuals were given to 2,544 additional persons (mostly children) without ill effects. An analysis of these cases indicates that some were probably in the incubation period of the disease when the vaccine produced a temporary period of lowered resistance or a "negative phase."

10. It is believed that the vaccine is probably safe for the immunization of human beings and especially when given during non-epidemic periods.

11. It is too early to express an opinion of the practical immunizing value of the vaccine, as a large group of vaccinated children must first be observed over a period of years. The results of immunization of monkeys and serum neutralization tests of children for antibody indicate, however, that effective immunization is possible.

12. The duration of the immunity cannot be given at present except to state that it has endured in monkeys up to at least 3 years, and antibody has persisted in children for at least 11 months. If, however, the immunity is found to protect children over their age of greatest susceptibility, it would appear that vaccination may be well worth while.

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Immunity in Virus Diseases With Particular Reference to Poliomyelitis*

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INFECTIOUS diseases are caused by protozoa, fungi, spirochetes, bacteria, Rickettsia, and viruses. At this time, however, we shall limit our remarks to certain phenomena associated with the diseases caused by the viruses or filterable viruses.

It is very difficult to define the term viruses. Nevertheless, the word has a very definite meaning to those actively working with them. Probably the best way to convey to you what is meant by these active agents is to enumerate some of the diseases incited by them, for example, bacteriophagy, mosaic diseases of plants, polyhedral diseases of insects, certain filterable tumors of fowls and rabbits, fowl-pox, fowl plague, foot-and-mouth disease of cattle, equine encephalomyelitis, psittacosis, rabies, measles, smallpox, vaccinia, varicella, fever blisters, St. Louis type of encephalitis, warts, poliomyelitis, yellow fever, etc.

From what has been said it is obvious that viruses cause a large number of devastating maladies. These incitants of disease are much smaller than ordinary bacteria, are invisible in the unstained state by means of ordinary light, and are obligate parasites in the sense that they have not been cultivated in the absence of living susceptible host cells. Their exact nature has not been determined. In fact, the viruses were first shown to exist and are still principally recognized clinically and experimentally by means of their activity in a host.

As public health officers and physicians, you are undoubtedly interested in measures directed toward the control, prevention, or eradication of the diseases caused by viruses. Quarantine measures are of little or no value in controlling measles, poliomyelitis, encephalitis, varicella, etc. The most successful known method for controlling certain virus maladies is by vaccines prepared and administered in the proper manner—for example, vaccination against smallpox, yellow fever, rabies, canine distemper, etc. In order to appreciate the difficulties encountered in developing an efficacious vaccine against a virus disease, one must have some understanding of the immunological phenomena observed in the virus field. It is with some of these phenomena that I shall deal before specifically discussing prophylaxis against poliomyelitis.

It has been shown that agglutinins, precipitins, complement-fixing antibodies, and neutralizing or protective antibodies may appear in the sera of

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individuals who have recovered from certain virus diseases. Moreover, an obvious infection with a virus usually leads to a state of increased resistance in the recovered host to further molestation by the same agent. It is of no particular interest, however, that such things take place in virus diseases, because they are known to occur in other types of infection. Nevertheless, there are some facts of particular interest which deserve consideration at this time:

1. Why is it so difficult to obtain an efficient immunity against virus infections by means of injections of vaccines composed of inactivated viruses?
2. Are the agglutinins, precipitins, complement-fixing antibodies, and protective antibodies the result of the stimulation of a host by means of a single antigen?
3. In what manner do the neutralizing or protecting antibodies act?
4. Why do so many virus diseases lead to a permanent immunity in recovered hosts?

Questions arising in regard to the immunization of individuals with inactive viruses are difficult to answer, because it is almost impossible at present to determine when a virus has been completely inactivated. For example, Lippert doubts whether Perdrau and Todd, by means of methylene blue and light, completely inactivated the canine distemper virus which later was shown to immunize dogs against distemper. Furthermore, Dunkin and Laidlaw have shown that formolized canine distemper virus will produce a fleeting immunity in vaccinated dogs, but in order to get a solid lasting resistance active virus must be employed. In the literature, statements are found that inactive viruses can act as efficacious vaccines, and canine distemper and yellow fever are cited as examples of diseases that can be prevented in this manner. Such statements are incorrect because field experiments with these two diseases offer no evidence that vaccines of inactive virus will prevent epidemics of them.

Certain workers are of the opinion that the amount of inactive virus is the all important factor, *i.e.*, if a sufficient amount were used, a solid immunity would result. Mackenzie reported that with small doses of inactive Rift Valley fever virus he was unable to immunize mice, while with large doses, 1 c.c. administered intraperitoneally, he was able to establish a good resistance in the animals to the active agent. Assuming that the virus was completely inactivated and that the mice were solidly protected, one must remember that a mouse weighs in the neighborhood of 20 gm. and that 1 c.c. or 1 gm. of the virus emulsion was administered, *i.e.*, approximately 1/20 of the body weight. On the basis of these figures a man weighing 150 lb. would require 7½ lb. of vaccine—not a very practical procedure.

When one brings up the question of the production of immunity by an inactive virus, antirabic vaccination is cited as an example of protection induced in this manner. I am glad to find, however, that some workers are no longer willing to accept dogmatic statements handed down to them in regard to antirabic vaccination, but insist upon exploring the field for themselves. As a result of this healthy skepticism it is being found that many batches of the Semple phenol-killed antirabic vaccine on the market will not immunize animals even when repeated large doses are employed. Nor is it surprising to find that the practice of giving dogs one dose of this material is frequently attended by the failure of the animals to be protected against rabies subsequently acquired through the bites of rabid animals.

Whatever viruses may be, in the active state they are antigens, and as such one would like to think of them

as containing proteins, or at least as being linked in some way to proteins. Therefore, if sufficient amounts of these agents in an inactive state, yet with their antigenic components not altered by inactivation, were administered to subjects in the form of vaccines, I would not be surprised to find complement-fixing antibodies, etc., appearing in the sera of vaccinated individuals; nor would I be disturbed to find that a certain amount of resistance to infection had resulted. In the past, however, it has not been possible to obtain viruses in sufficient amounts in a relatively pure state to determine what happens to their antigenic components when inactivated. Recently, Craigie has opened up this field in regard to vaccinia and has found that vaccine virus is composed of several antigens some of which are extremely labile and appear to function in the production of resistance, while others are stable and induce the formation of agglutinins, etc. Parker, working in my laboratory, has confirmed many of Craigie's findings. What Craigie has accomplished for vaccinia must be done with other virus maladies, and, in the meantime, generalizations should be suspended.

For the sake of argument let us assume that it has been demonstrated that a certain degree of immunity can be obtained by a completely inactive virus provided sufficient amounts are administered. What about the duration of the protection induced in this manner? All the evidence at hand seems to indicate that whatever protection is produced in this way endures only for a relatively short time. Even this fact is admitted in regard to the antirabic vaccination of dogs, the yearly repetition of which is advised. Furthermore, the Pasteur treatment is repeated each time a human being is bitten by a rabid animal. Strange to say, many workers do not seem to be disturbed by this fact. In the case of hogs and cattle that are raised for the meat market and will live for a short time only it is not necessary to produce a lasting immunity. Nevertheless, the duration of an immunity produced by vaccines, particularly when the vaccines are expensive to make and difficult to administer, is of great importance in the protection of human beings against smallpox, yellow fever, measles, poliomyelitis, etc.

As a rule, the serum from a host recovered from a virus disease possesses neutralizing or protective properties. For instance, an appropriate amount of convalescent serum mixed with the homologous virus results in what is called a neutral mixture, *i.e.*, the mixture of virus and convalescent serum does not produce evidences of disease in a susceptible host. Furthermore, in many instances, sufficient convalescent serum injected into a susceptible host prevents the production of disease by the homologous virus inoculated just prior to or within a short time after the administration of the serum. The latter fact is the basis for the use of convalescent or immune serum in the prophylaxis against virus maladies, including poliomyelitis. However, the results with poliomyelitis are not as striking as are those obtained with measles, and the passive protection thus developed in monkeys against poliomyelitis endures only for a few days.

The manner in which the neutralizing or protective antibodies act is not known. In spite of this fact, most workers are agreed that the viruses in the so-called neutral mixtures which are usually injected into animals shortly after preparation are not really dead or inactive.

Viruses seem to multiply inside of cells, and it has been repeatedly shown that, once the viruses have come in contact with susceptible cells or have entered them, the protective or neu-

tralizing properties of convalescent or immune serum have no power of preventing injury or death of the parasitized cells. Furthermore, it has been shown that cells may be infected several days before any evidences of such infection are obvious. Usually, by the time an infected host begins to show signs and symptoms of a virus illness, all the cells that are going to be involved during that attack have already been entered by the infecting agent. Consequently, in virus maladies serum therapy given after the onset of signs and symptoms of illness is of little or no value. There is ample experimental and clinical evidence that such is the case, and poliomyelitis seems to be no exception to the rule.

It is a well recognized fact that recovery from a virus infection is usually followed by an enduring immunity. In many instances the immunity is operative during the remainder of an individual's life. Of course there are exceptions to the rule. For example, common colds recur repeatedly in the same individual, and herpes simplex or fever blisters occur at frequent intervals in the same subjects. The persistence of immunity in hosts recovered from virus diseases is so striking that it is not surprising that an explanation of the phenomenon has been sought. Furthermore, if it is the rule to encounter a lasting immunity in virus diseases, one would like to know the reason for the exceptions.

In the case of poliomyelitis and measles, the viruses of which one encounters from time to time throughout life, one might explain the persistent immunity and the presence of neutralizing antibodies on the basis of repeated contacts with the active agents. On the other hand, it is impossible to explain in such a manner the enduring immunity to yellow fever, which is accompanied by the presence of humoral antibodies, in individuals who have been out of yellow fever zones for periods of 25 to 50 years.

In view of the facts mentioned above, and because it is known that a refractory state to some bacterial and spirochetal diseases is associated with a persistence of these agents in the hosts, it has been suggested by a number of workers that at least in certain instances the protracted immunity following virus diseases is due to a prolonged or a persistent sojourn of the viruses in hosts once infected. This persistence of the viruses does not indicate that the hosts are capable of spreading disease.

Without enumerating them, I can state that sufficient instances in which viruses have been recovered from immune hosts have been recorded to show that it is not an unusual occurrence. Nor is it unlikely that, in certain instances, there is a causal relation between the persistence of the virus and the enduring immunity of the host. Moreover, it must be remembered that failure to recover a virus from an immune host is not necessarily positive evidence that it is not present.

In what way is it possible for viruses to persist in an immune host? It is most likely that these agents are intracellular parasites, and as long as they remain situated within living cells are in no danger of being eliminated from the body. If they do not kill the host cells, they can multiply and pass into daughter host cells. In this manner it is possible for them to remain indefinitely in an immune host. Such is undoubtedly what happens in the case of the Rous tumor.

At this point it is well to speak of the apparent lack of a lasting immunity to fever blisters. This disease is particularly interesting because the individuals who have recurring attacks possess an abundance of neutralizing antibodies in their sera. The paradox has been explained on the basis of the

persistence of the virus in the cells of immune individuals, who develop crops of blisters whenever subjected to the conditions that are encountered as the result of typhoid vaccination, common colds, and exposures to high temperatures for several hours, etc.

Why does one fail to develop a permanent immunity to common colds? I do not know. It is interesting to speculate, however. The cold virus may be unable to establish itself permanently in the host; it may act in a manner similar to that of fever blister virus; or the superficial nature of the infection caused by it may have something to do with the poor development of immunity.

Experience showed that recovery from most virus diseases results in an enduring immunity. Later it was found that the sera of individuals recovered from certain of these maladies possess neutralizing or protective antibodies. Consequently, a number of workers think that the presence of neutralizing antibodies in the serum of a person always indicates that the individual is immune. This is probably true when the antibodies are the result of a natural infection. In other words, the individual is known to be immune not because of the antibodies, but because of recovery from a natural infection as indicated by the presence of antibodies.

The state of affairs may be different when a host is artificially immunized against certain virus maladies. Why? —I do not know. In any event, in vaccinated individuals resistance to infection does not necessarily parallel the presence of neutralizing antibodies, as has been demonstrated in dogs vaccinated against rabies. That is, vaccinated dogs may possess neutralizing antibodies and still be susceptible to rabic virus. Parker and I have found a similar state of affairs in rabbits that had received repeated injections of formolized elementary bodies of vaccinia; some of the animals had neutralizing antibodies for vaccine virus without being resistant to a vaccinal infection. Furthermore, Hudson, Schultz, and Olitsky have shown that monkeys vaccinated against poliomyelitis may be susceptible to infection in spite of the presence of neutralizing antibodies in their sera. It is evident that the above observations are of significance when one attempts to evaluate the work of Brodie and Kolmer who lay a great deal of stress upon the fact that monkeys and human beings vaccinated according to their methods against poliomyelitis develop or increase the amount of antibodies in their sera.

In the light of the general remarks regarding the immunological phenomena observed in the virus field, the following specific statements about poliomyelitis and the vaccines prepared by Brodie and Kolmer will be more intelligible.

There is one fact that must be held in mind. It is that the virus of poliomyelitis, either active or inactive, acts as though it was a poor antigen. Even large amounts of it in the active state administered intracutaneously or subcutaneously do not regularly produce resistance to infection in monkeys. Furthermore, intracerebral doses of active poliomyelitis virus, too small to induce an obvious infection in monkeys, will not immunize the animals. Thus it does not follow that the introduction of active virus into monkeys and human beings will result in their effective immunization against infection. This fact is well illustrated by the findings of Schultz and Olitsky who repeated Kolmer's work on monkeys and were unable to demonstrate as much protection as that reported by Kolmer for his animals.

The amount of antigen in the form of active poliomyelitis virus is a very important item in attempts to immunize monkeys by way of the intracutaneous

or subcutaneous route. Even large amounts are not always effective, and investigators working in the effective range have invariably found that an occasional monkey becomes paralyzed as a result of the immunizing doses, and, for this reason, have considered it inadvisable to use active virus for the vaccination of human beings.

In view of what has just been said, the fact that there is, so far as I know, no comparable number of unvaccinated children, properly chosen in regard to location and age, to act as controls for the efficacy of the vaccine in the individuals receiving it, leaves us with a lack of definite information regarding the value of Kolmer's vaccine in the prevention of poliomyelitis in human beings.

Kolmer bases his claim for the safety of his vaccine upon the fact that it is prepared from remote monkey passage poliomyelitis virus that has been further attenuated by contact with glycerol, sodium ricinoleate, and phenylmercuric-nitrate. A statement that monkey passage poliomyelitis virus is less infectious for man than is the natural or human virus is an assumption without experimental evidence to substantiate it. Investigators familiar with work in the virus field would not put too much dependence on such an assumption. It is true that the passage of some viruses through unnatural hosts decreases their virulence for the natural ones. However, this is by no means a regular occurrence.

Many workers state that single applications of certain chemical agents attenuate viruses. This is true if they mean by such a statement that some of the virus units are completely inactivated while others are uninfluenced. In other words, it is usually a misconception to think of this kind of attenuation of viruses as a decrease in the virulence of each virus unit instead of a decrease in the number of active unaltered ones. The evidence is that when a virus emulsion has been treated with a chemical agent and is still capable of causing disease, even though the incubation period is greatly prolonged, the virus recovered from the sick animal is fully virulent. Thus it appears that attenuation by a single application of chemicals is as a rule equivalent to dilution. Dilution alone is the principle employed in the Högyes and Harris methods of vaccination against rabies. In reality, it is the principle operative in the drying of the cords for the old Pasteur method of vaccination. Consequently, it is unlikely that the virulence of each unit of poliomyelitis virus in Kolmer's vaccine is altered by the chemicals used. Therefore, just as good results probably could be obtained by dilution of the virus emulsions as by treatment of them with chemical agents. In fact, it might be better to use diluted material, because then it would be unnecessary to administer a large quantity of useless but troublesome brain substance.

Kolmer admits that at least 10 cases of paralysis have occurred after 1 or 2 doses of the vaccine, and assumes that they were not caused by its administration but by a natural infection acquired through exposure. In support of this assumption, he considers to be of significance the fact that paralyses have occurred after the first or second dose of vaccine instead of the third. Many workers would agree with him that the fact is significant, but would not agree with him in regard to his interpretation of the significance.

It must be remembered that the vast majority of children vaccinated would never have contracted poliomyelitis even though they had not received the vaccine. For unknown reasons, most children are much more resistant to poliomyelitis than are the remaining few. It is possible that the resistant

children were able to stand 3 doses of vaccine, while the most susceptible, the ones highly in need of protection, could not resist the active virus in the vaccine and same down promptly with poliomyelitis after 1 or 2 doses. I do not contend that this is the correct interpretation of the state of affairs, but it is just as plausible, if not more so, than the one offered by Kolmer, *viz.*, that the children were paralyzed by virus acquired through natural exposure instead of by the active virus in the vaccine. Therefore, in view of certain pertinent facts regarding the cases of paralysis following his vaccine it is essential for Kolmer to show definitely that it is safe.

Brodie has chosen to use what he says is inactive poliomyelitis virus for the vaccination of monkeys and children. Others employed such a virus for the immunization of monkeys many years before Brodie, and found the results so discouraging that the matter was not pursued in man.

All of Brodie's favorable results depend on his ability to titrate regularly and accurately 1 minimum completely paralyzing dose of virus. If this cannot be done, then all of his reported findings are invalid. So far as I know, no one has been able to obtain titration results similar to Brodie's, and this is not due to a lack of efforts to do so. Furthermore, Schultz and Olitsky have attempted to immunize monkeys with a vaccine prepared according to Brodie's method and have been able to find little, if any, protection in them against infection.

Recently, I had the opportunity of discussing the matter with Brodie and came to the conclusion that no case of poliomyelitis can as yet be ascribed to the use of his vaccine. Nor could I find any evidence for or against the efficacy of his vaccine. If I were asked for a prophecy, I would say: If Brodie does not make the time of inactivation of the virus too short, and if he continues to administer the vaccine in the manner now employed, it will be reasonably safe but ineffective, particularly if one expects an appreciable degree of protection to persist for any great length of time.

I trust that I have not burdened or bored you with details of immunological phenomena in the virus field. My remarks were made with the intention of showing that there is no reason at present to believe that the general principles of immunity, many of which are not known or understood, fail to operate in this field, and that most of the immunological and serological oddities encountered in this domain can be accounted for by the intimate type of parasitism exhibited by the viruses or by the multiplicity and lability of antigens involved. Finally, it was necessary to present many of the details in order to emphasize sufficiently the fact that it may be difficult, but I hope not impossible, to devise satisfactory vaccines for the prevention of certain virus maladies.

DISCUSSION OF POLIOMYELITIS PAPERS

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FROM the viewpoint of the public health administrator I assure you that it it is very essential that we have some definite advice as to what procedures we should follow in our endeavor to control poliomyelitis, and we would like to know whether we have reached the stage where there is a vaccine which is reasonably effective and at the same time safe.

Dr. Kolmer brought out the fact that there had been reported several cases of illness suggestive of poliomyelitis following the administration of 1 or 2 doses of his vaccine but in no case had clinical poliomyelitis been reported in a child who had received 3 full doses of the vaccine. He reports 10 cases which have been officially diagnosed as poliomyelitis following the use of the vaccine, 5 of which died, and also he states that 8 of these cases occurred in localities where poliomyelitis was epidemic, and among these he included the cases in New Jersey.

The official records of the Newark Health Department indicate that prior to September 20, 1935, there had been reported 21 cases of poliomyelitis, 1 in June, 1 in July, 5 in August, and 14 in September. The June case died as did 2 of the September cases. This incidence of poliomyelitis prior to September 20 is approximately the normal expectancy for 1935 based upon previous experience in this community.

In Dr. Kolmer's report he cites 1 case having occurred in July in Newark following the administration of the vaccine and as but 1 was officially reported to the health department, I am led to the inevitable conclusion that this is the case to which Dr. Kolmer referred. It would not appear that poliomyelitis was epidemic in Newark at the time the case occurred.

There were also reported in Dr. Kolmer's series 2 cases which developed following the administration of vaccine in Plainfield, N. J. One child received his initial dose of vaccine on August 24, his second dose on August 31, was taken ill on September 4, admitted to the hospital on the 5th, and died the following day. The second child received his first dose of vaccine early in August, his second August 31, and developed symptoms of poliomyelitis on September 6, was hospitalized and died on September 9. These are the official records which I have obtained from the Health Department at Plainfield. I have also been informed that during the first 19 days of September there were but 5 cases and 2 deaths from poliomyelitis officially reported to the Health Department of Plainfield, and I would assume that the 2 cases to which Dr. Kolmer referred, both of which terminated in death, must have been included in the series. Again, it would not appear that poliomyelitis was epidemic in this community at that time.

Dr. Kolmer further stated that he had included in his series all instances where children had contracted a disease suspicious of poliomyelitis following the giving of his vaccine, but I fail to find any reference to a case which was officially reported in Detroit in the month of August. It is true that this Detroit case has been explained

by the attending physician on the basis of previous exposure, but if Dr. Kolmer is to include in his series all cases which are to be explained on this basis, he should, I believe, include the Detroit case.

The official records in the possession of the Detroit Health Department indicate that a 10 year old boy was seen by a local physician on August 10, complaining of fever, headache, and a sore neck of 3 days' duration. This case was diagnosed as tonsillitis. The child, however, had been attending a boys' camp and one of his tent-mates had been reported as having poliomyelitis. Accordingly, the attending physician administered the first dose of Dr. Kolmer's vaccine on August 10, and our records indicate that the second dose was administered on August 17, and the child admitted to the Herman Kiefer Hospital on August 21, where he remained for nearly 3 weeks, and where the case was considered as a non-paralytic form of poliomyelitis. The child recovered.

I wish to reëmphasize the fact that from the epidemiologic evidence at hand it does not appear reasonable to explain all cases of poliomyelitis following vaccine as due to previous exposure. I would wish to have far more detailed information concerning the life case history of each. Also, I do not personally believe that the public health administrator is justified in using this vaccine as a part of his poliomyelitis control procedure; in fact, with the evidence at hand, it would be most inadvisable for the health officer to use this vaccine.

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I AM thoroughly convinced that there are several types of this disease and that mild or variant forms exist in which there is no detectable evidence of meningitis or myelitic involvement, and that there is very little uniformity of opinion with regard to their diagnostic criteria. The perfectly frank cases may be considered those cases which develop paralysis in association with the usual signs of the disease. My own concept of the disease has been drawn from the observations of 1,274 cases in one epidemic and several lesser epidemics. Of the 1,274 cases, 812 were definitely paralyzed, and in 118 of the 812, the spinal fluid showed a varying degree of cellular increase ranging from 8 to 8,000. Two hundred and five of the cases were classified as abortive; the limits of the clinical picture of this type is uncertain, but in my observations it consisted of an acute febrile disease, the temperature lasting from 12 to 72 hours, vomiting, sore throat, pain and tenderness, slight stiffness of the neck or back, and the patient left feeling below par for several days. In this group the statement was frequently made by the mother that all the children in the family had been ill and one eventually developed paralysis. Two hundred fifty-seven of the cases were classified as "type unknown," falling into the class suggested by Frost: "those in which the clinical symptoms were so indefinite as to furnish no basis for a differentiation from various common infections, but on account of intimate association with a definite case, the diagnosis was suggestive."

I believe the abortive type to be very

common, manifested especially during epidemics by such minor symptoms as fever, headache, and vomiting. It is this type which is frequently referred to as "summer influenza," "summer grippe," acute tonsillitis or gastro-enteritis. From my limited knowledge of the 1935 epidemic in Virginia, I am inclined to believe that had only frankly paralyzed cases been accepted, the number reported would have been far less.

It appears to me that the disease occurs in different severity in different epidemics, one epidemic showing a majority of paralytic cases and another in the same locality being characterized by the non-paralytic or sub-clinical type. I believe Dr. Leak's observation will bear this out.

In one epidemic where the opportunity existed to make a post-clinical study of abortive cases, it was found that reflexes were diminished or absent and definite muscle weakness established in one or more groups of muscles, and in a few instances where a biopsy was obtained, it was demonstrated by microscopical examination that there actually existed degeneration of muscle fiber in which no gross disturbances of function was demonstrable.

As to vaccines for the prevention of this disease, I believe the scientific research should continue, but their use should be limited to a few selected persons, so that methods may be uniform and results carefully studied.

JOHN F. KESSEL, M.D.

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THE first papers of this symposium, giving the experience of the workers in the recent epidemic of poliomyelitis in North Carolina and Virginia, have presented material which indicates that we in California are not the only individuals who experience the unusual. It would appear from their reports that the recent epidemic through which they have passed has many parallels, particularly with reference to the spinal fluid picture, the low mortality and low residual paralysis rate with our experience in the epidemic of 1934 and 1935 in Southern California.

We have often had the question raised as to whether we were actually dealing with typical poliomyelitis, and in attempting to answer have proceeded with caution. The experiences recorded today encourage us in the opinion that we were dealing with poliomyelitis in Southern California, though in a somewhat atypical form.

One aspect of special interest in our epidemic was the high communicability rate as illustrated by the large number of doctors, nurses, and other hospital employees who become infected. In 1934 some 200 of our employees developed poliomyelitis, and during the summer of 1935 approximately an additional 50 developed the disease.

The fact that most of those coming down in 1935 were individuals who were not working in the hospital during the 1934 epidemic, and therefore had developed no immunity, brought us face to face with the question as to whether or not in our institution we should use the vaccines being reported as having merit. Our hospital poliomyelitis committee sent representatives

TABLE I

SHOWING INDIVIDUALS RECEIVING POLIOMYELITIS VACCINE
JUNE TO OCTOBER, 1935

	Brodie's Vaccine	*Kolmer's Vaccine*
Nurses—(entering before October, 1934)	41	36
(entering between October, 1934 and June, 1935)	44	26
(entering October, 1935)	68	0
Doctors	48	13
Technicians	14	0
Orderlies	8	10
Retention Homes	108	0
Total	331	85
Grand Total 416		

to the Bakersfield area where some 2,000 cases had been vaccinated with the Brodie vaccine with no untoward results. After careful consideration the committee decided that it would be unfair to withhold the vaccine, which might possess merit, in such an emergency, and accordingly made arrangements with Dr. Brodie and Dr. Kolmer, both of whom transmitted definite statements to the hospital authorities declaring their belief in the safety of their products, to give their vaccines to volunteers who would sign a statement recognizing the fact that they were in their experimental stage and thereby assuming responsibility. Minors who took the vaccines were required to have their parents sign the records. In all, 416 received the vaccines, as indicated by Table I:

It will be observed that the Brodie vaccine was given to a greater number than was the Kolmer, the reason being that certain members of the committee considered that a vaccine made from living virus might possess potential dangers, and therefore it was considered safer to discontinue its use, since we preferred to allow groups other than ours to experiment with this type of vaccine.

The table shows the distribution of the vaccinated individuals among the employee groups to which they belonged. It is difficult to keep adequate parallel controls in a series of vaccinated individuals of this type and it has been found impossible to do so with each group individually.

There is one group of nurses, however, which has yielded rather interesting results. This is made up of student nurses and affiliate student nurses who came to work in the Los Angeles County Hospital following the peak of the 1934 epidemic. Altogether, since October 4, 1934, to June 1, 1935, 189 came to work in the hospital. Of these, 45 had developed poliomyelitis by June 15, the date that our vaccinations began, leaving 144 who were well at that time. Of the 144, 70 received vaccine, either Brodie's or Kolmer's, and 74 were not vaccinated. Of the vaccinated, 2 developed poliomyelitis within 3 or 4 days after the administration of the vaccine, 1 from the Brodie series and 1 from the Kolmer series. Of the unvaccinated, 1 developed poliomyelitis within this time. These 3 cases should be ruled out since they undoubtedly were in the incubation stage at the time the experiment began. Of the remainder, none developed poliomyelitis among the vaccinated, while 3 came down during July among the unvaccinated.

The results may be reduced to include only nurses who came to work after February 1, 1935, leaving out from the series those who began to

work in October, 1934. These results may be tabulated as follows:

			Developed Poliomyelitis
Received vaccine	Brodie's	27	None
	Kolmer's	15	
		42	
Received no vaccine		50	3

From these few cases it is seen that 6 per cent of the unvaccinated subsequently developed poliomyelitis, but none of the vaccinated. These data are few in number and I hesitate to attach great significance to them. However, since no untoward results have developed, it would appear, in so far as our records are concerned, that its use is not contraindicated.

Of interest is the type of reaction following vaccination. Local reactions were, as a rule, moderate and no abscesses developed at the site of injection. There were, however, a number of severe constitutional reactions, 9 among those receiving the Brodie vaccine and 5 among those receiving the Kolmer vaccine. In each instance there was a marked soreness at the point of injection and about 4 hours after the injection a generalized reaction with chills and fever developed, which lasted from 6 to 10 hours and then subsided. Soreness was marked in these cases and lasted for 24 hours.

MAURICE BRODIE, M.D., F.A.P.H.A.

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INASMUCH as the formalized vaccine we have been using appears to be perfectly safe and inasmuch as there is nothing to contraindicate its efficiency, we feel that further controlled studies should be continued until a definite evaluation can be obtained. This can be accomplished only through a strictly controlled distribution of the virus through health officers or clinics with the proper follow up.

It is agreed by all that heat killed vaccine cannot produce immunity, but there is evidence that viruses rendered non-infective by other means may still be antigenic. Examples have been cited, and Dr. Rivers has mentioned the action of methylene blue and light on various viruses. Studies such as these indicate that the changes may be either quantitative or qualitative. For example, we have found Semple vaccine non-infective for guinea pigs and rabbits, yet it may infect the more susceptible mouse. This, and the fact that formalin treated vaccine gives an antibody response only when the formalin acts for the shortest time required to render it non-infective, suggests the possible presence of an amount of virus too small to infect. An example of a qualitative change is the action of methylene blue and light in which a virus becomes non-infective and antigenic.

One cannot always interpret human experiments in the light of results of animal experiments and so a method that produces a small degree of immunity in the monkey, which is a difficult animal to immunize, may be far more efficacious in the human. This has been suggested by the better antibody response of children to the vaccine. Moreover, no immunity is absolute and a moderate degree in children may be built up more strongly and maintained through further exposures.

DISCUSSION (*Cont.*)

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IT was not my intention to participate in this discussion, but since my name has been mentioned, I must state that I did not express a belief that the vaccine was not responsible for Case 10. In any individual case the possibility should be left open that natural infection was operative, but the meaning of the series as a whole is clear to me, and I beg you (Dr. Kolmer) to desist from the human use of this vaccine. According to my count of the onsets, 1 fatal case occurred 6 days after the second dose, another fatal case 6 days after the second dose, and 12 days after the first dose, 2 paralytic cases and 1 fatal case 8 days after the first dose, a fatal case 9 days after the first dose, another fatal case 10 days after the first dose, a paralytic case 11 days after the first dose, and another paralytic case 14 days after the first dose.

In each instance in which the site of the injection and the site of the first paralysis is known, the latter occurred either in the limb injected, or in the corresponding limb of the opposite side; in other words, the cells of the spinal cord first involved were at the same level as the injection. The anatomists tell us that the lymph streams accompanying the peripheral nerves do not enter the vertebral canal, so that there is no direct connection between the blood or lymph supply of a limb and the corresponding level of the spinal cord. These cases would therefore tend to show, what experimental work has already indicated, that the virus of poliomyelitis travels along the nerve fibers themselves.*

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* At a luncheon session of the Health Officers Section of the American Public Health Association at the Sixty-fourth Annual Meeting in Milwaukee, Wis., October 10, 1935, Dr. Leake mentioned a fatal case occurring 14 days after the first and only dose of another vaccine, as possibly being parallel to the cases above cited. Since then 2 other paralytic cases have occurred 13 and 14 days, respectively, after administration of the same vaccine. While any one of these alone would be dubious, the periods of time between vaccination and onset, in connection with the series above cited, appears to justify discontinuance of the human use of this vaccine also.

NOTE: For details of cases mentioned, see *J.A.M.A.*, Dec. 28, 1935, p. 2152.

An Improved Method of Preparing the Kolmer Poliomyelitis Vaccine*

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IN the preparation of poliomyelitis vaccine by the method of Kolmer [1] 8 gm. of remote monkey passage spinal cord are thoroughly emulsified aseptically in 100 c.c. of sterile saline solution. After fine-mesh filtration to remove coarse particles, there is added an equal volume of sterile 2 per cent solution of sodium ricinoleate (William S. Merrell Company) which gives a 4 per cent suspension of virus in 1 per cent sodium ricinoleate. This mixture is placed in an incubator at 37° C. for 24 hours and then in a refrigerator at 10° to 12° C. for 10 to 14 days, with daily shaking for a few minutes, when aerobic and anaerobic cultures are made and mice injected intraperitoneally as an additional test for any possible contamination with tetanus bacilli or spores. When a careful aseptic technic is employed, the great majority of the vaccines are found to be sterile.

PURPOSE OF INVESTIGATION

Since sodium ricinoleate is of low bactericidal activity, care is required against subsequent accidental bacterial contamination of the vaccine, especially during its administration. For this reason we have sought to determine if it is possible to add germicidal agents in bactericidal amounts without reducing the immunizing capacity of the vaccine, in order to prevent accidental contamination, such as has occurred in a few instances, with the production of severe local reactions at the sites of inoculation.

Since we are convinced that the immunizing value of the vaccine depends upon the presence of living attenuated virus, this has meant the possibility of finding a chemical agent capable of selectively destroying such organisms as staphylococci, streptococci, *B. coli*, and *B. subtilis*, without materially destroying the virus, since these organisms are of most importance from the standpoint of possible contamination in the preparation and administration of the vaccine.

For this purpose we have contaminated portions of sterile vaccine with these organisms and determined the approximate smallest amounts of formalin, phenol, mercurophen, merthiolate, and phenyl-mercuri-nitrate capable of sterilizing in an exposure of 24 hours at 37° C. We conducted the tests with the finished ricinoleated vaccine with an exposure of 24 hours at 37° C. in order to duplicate exactly practical working conditions in the preparation of the vaccine, as well as to include the bactericidal activity of sodium ricinoleate and the influence of the spinal

* Read before the Laboratory Section of the American Public Health Association, at the Sixty-fourth Annual Meeting in Milwaukee, Wis., October 8, 1935.

† With the assistance of Anna M. Rule.

cord protein in reducing the bactericidal activity of the chemical agents employed.

As soon as the bactericidal activity of the 5 chosen agents for the 4 organisms was determined, we prepared 5 ricinoleated vaccines exactly as outlined except that 1 carried the *minimum* bactericidal concentration of formalin, a second phenol, a third mercurophen, a fourth merthiolate, and a fifth phenyl-mercuri-nitrate. These 5 vaccines were employed in the immunization of monkeys to determine whether the antiseptics had caused any reduction in their vaccinogenic activity.

Another factor which has engaged our attention is the possibility of *Macacus rhesus* monkeys harboring in the central nervous system the virus of lymphocytic choriomeningitis described by Armstrong and his colleagues [2, 3, 4] and which they believe may produce a benign type of so-called "aseptic meningitis" in human beings. Fortunately, according to these investigations, it is possible to detect the virus in the brain and spinal cord of monkeys by intracerebral inoculation of mice and guinea pigs. We have included this test routinely on all monkey poliomyelitic spinal cords and brains before using the former in the preparation of vaccine. We have not encountered the virus in a single animal.

BACTERICIDAL TESTS

Tests were conducted with formalin (U. S. P.), phenol (U. S. P.), mercurophen (Sharp & Dohme), solution 45 of merthiolate 1:1,000 (Lilly Co.), and phenyl-mercuri-nitrate (Merrell Company). One hundred c.c. portions of finished sterile ricinoleated vaccine were contaminated with 1 c.c. of a 24 hour broth culture of *Staphyloccus pyogenes aureus* and 1 c.c. amounts added to 1 c.c. of dilutions of formalin 1:1,000 to 1:6,000, giving final dilutions of 1:2,000 to 1:12,000. These were thoroughly mixed and placed at 37° C. for 24 hours, when 0.5 c.c. of each was sub-cultured in 200 c.c. of nutrient broth, in order to dilute the formalin carried over well beyond its bacteriostatic threshold. These sub-cultures were incubated for 3 days when the results were recorded. At the same time duplicate tests were conducted with ricinoleated vaccine contaminated with similar amounts of 24 hour broth cultures of hemolytic streptococcus, *B. coli*, and *B. subtilis*. Phenol was used in final dilutions of 1:80 to 1:400; mercurophen and merthiolate in 1:30,000 to 1:160,000; and phenyl-mercuri-nitrate in 1:40,000 to 1:240,000 in similar tests with the 4 organisms.

The results summarized in Table I show the bactericidal activity of the 5 agents for the 4 organisms according to the technic employed. The tests were conducted 3 times, and while the results were not identical, yet those shown are, we believe, approximately correct. The streptococcus was most easily destroyed. The staphylococcus ranked next in susceptibility to all 5 agents, while the colon bacillus was more resistant than *B. subtilis*, probably because sodium ricinoleate has a peculiar bactericidal and bacteriostatic activity for this spore-bearing organism.

The mercurial compounds were most bactericidal. Phenyl-mercuri-nitrate gave the best results followed by mercurophen, merthiolate, formalin, and phenol, in the order of bactericidal activity.

PREPARATION OF VACCINES

Five ricinoleated vaccines were then prepared of monkey poliomyelitic spinal cord as previously described [1] except that the solution of sodium ricinoleate carried twice the minimal bactericidal amounts of the 5 germicides, the amounts employed being:

TABLE I

RESULTS OF BACTERICIDAL TESTS

Ricinoleated Vaccine	*Final Dilutions*	*Bactericidal Results*			
		Staph. aureus	*Hemolytic strept.*	*B. coli*	*B. subtilis*
+ Formalin	1:2,000	—*	—	—	—
	1:3,000	—	—	—	—
	1:4,000	—	—	—	—
	1:6,000	—	—	+	—
	1:8,000	+	—	+	—
	1:12,000	+	—	+	+
+ Phenol	1:80	—	—	—	—
	1:100	—	—	—	—
	1:160	—	—	—	—
	1:200	—	—	—	—
	1:320	+	—	+	—
	1:400	+	—	+	+
+ Mercurophen	1:30,000	—	—	—	—
	1:40,000	—	—	—	—
	1:60,000	—	—	—	—
	1:80,000	—	—	—	—
	1:120,000	+	—	+	—
	1:160,000	+	—	+	+
+ Merthiolate	1:30,000	—	—	—	—
	1:40,000	—	—	—	—
	1:60,000	—	—	—	—
	1:80,000	—	—	—	—
	1:120,000	+	—	+	—
	1:160,000	+	—	+	+
+ Phenyl-Mercuri-Nitrate	1:40,000	—	—	—	—
	1:60,000	—	—	—	—
	1:80,000	—	—	—	—
	1:120,000	—	—	—	—
	1:160,000	—	—	—	—
	1:240,000	+	—	+	—
Ricinoleated Vaccine	Controls (4)	+	+	+	+

*— = no growth; + = growth

formalin 1:4,000; phenol 1:100; mercurophen 1:40,000; merthiolate 1:40,000; phenyl-mercuri-nitrate 1:80,000.

RESULTS OF IMMUNIZATION OF MONKEYS

Six monkeys were used for each vaccine; 2 received 0.05 c.c. per kg. subcutaneously every 5 days for 5 doses, 2 0.25 c.c., and 2 0.5 c.c. Twelve days after the last dose each animal received an intracerebral injection of 0.5 c.c. of 5 per cent virus (about 10 minimal infective doses) as a test for acquired immunity, and all animals were kept under daily observation for 4 weeks.

Six additional monkeys were immunized with the ricinoleated vaccine alone as controls, and 4 monkeys received an intracerebral injection of the virus alone at the time the tests for immunity were conducted as controls on the infectivity of the virus. The results are summarized in Table II.

All of the 4 monkeys receiving intracerebral injections of the virus alone

TABLE II

RESULTS OF IMMUNIZATION OF MONKEYS

Vaccines	*Dose per Kg.* (c.c)*	*Results of Intracerebral Inoculation with Virus as Test for Immunity †*
Sodium Ricinol. Vaccine	0.5	Normal
	0.5	"
	0.25	"
	0.25	"
	0.05	Developed paralysis on 11th day
	0.05	" " " 14th "
Same + Formalin 1:4,000	0.5	Developed paralysis on 10th day
	0.5	" " " " "
	0.25	" " " 8th "
	0.25	" " " 7th "
	0.05	" " " 7th "
	0.05	" " " 8th "
Same + Phenol 1:100	0.5	Normal
	0.5	"
	0.25	Developed paralysis on 12th day
	0.25	" " " 14th "
	0.05	" " " 7th "
	0.05	" " " 7th "
Same + Mercurophen 1:40,000	0.5	Normal
	0.5	"
	0.25	Developed paralysis on 17th day
	0.25	" " " 20th "
	0.05	" " " 8th "
	0.05	" " " 8th "
Same + Merthiolate 1:40,000	0.5	Normal
	0.5	"
	0.25	Developed paralysis on 16th day
	0.25	" " " 20th "
	0.05	" " " 7th "
	0.05	" " " 7th "
Same + Phenyl-Mercuri-Nitrate 1:80,000	0.5	Normal
	0.5	"
	0.25	"
	0.25	Developed paralysis on 21st day
	0.05	" " " 8th "
	0.05	" " " 8th "

* Every 5 days by subcutaneous injection for 5 doses.
† 0.5 c.c. of 5 per cent virus (about 10 minimal infective doses) given 12 days after last dose of vaccine.

developed severe paralysis 7 to 8 days after inoculation.

None of the monkeys developed paralysis from any of the vaccines alone, even in doses as large as 0.5 c.c. per kg. This confirmed our previous observations that subcutaneous injections of virus treated with sodium ricinoleate has not produced poliomyelitis in monkeys, even though the strain employed has been well adapted to this animal.

The best results were observed with the regular ricinoleated vaccine without the addition of any germicide, since all of the monkeys receiving 0.25

and 0.5 c.c. per kg. for 5 doses were completely protected against the intracerebral injection of about 10 minimal infective doses of virus. Those receiving 0.05 c.c. per kg. probably had a slight degree of immunity since paralysis did not appear until 11 to 14 days after intracerebral inoculation with virus, whereas the unvaccinated controls developed paralysis on the 7th and 8th days. A monkey inoculated intracerebrally with 0.3 c.c. of the vaccine developed paralysis 10 days later, indicating that the vaccine contained living but probably slightly attenuated virus.

None of the monkeys receiving the formalized vaccine were protected. We do not know whether the virus was completely killed by the amount of formalin used, but certainly the doses of this vaccine employed were insufficient to engender a protective degree of immunity to the intracerebral injection of the 10 minimal infective doses of virus employed as a test for acquired immunity. In this connection it may be stated that a monkey inoculated intracerebrally with 0.3 c.c. of the vaccine remained perfectly well, indicating that the virus was either killed or greatly attenuated. It may be that larger doses per kg. of weight would have engendered an immunity, but none was apparent with the amounts employed.

With the phenolized vaccine both monkeys receiving the 0.5 c.c. dose developed effective immunity. With the 0.25 c.c. dose some immunity was apparently produced because paralysis did not develop until the 12th to 14th day after intracerebral inoculations of virus; but those receiving the 0.05 c.c. dose apparently developed no immunity at all. A monkey inoculated intracerebrally with 0.3 c.c. of this vaccine developed a slight degree of paralysis of the right arm 18 days later, indicating that the vaccine contained a small amount of living virus which probably accounted for the immunity engendered by the larger doses.

The vaccines carrying mercurophen 1:40,000 and merthiolate 1:40,000 engendered complete protection in the 0.5 c.c. doses. Some immunity resulted from the 0.25 c.c. dose, but undoubtedly the addition of these agents in concentration of 1:40,000 reduced to some extent the immunizing value of the ricinoleated vaccine.

That these agents, however, produced some slight destruction or attenuation of the virus is indicated by the fact that monkeys inoculated with 0.3 c.c. of each vaccine did not develop paralysis until 14 days later, whereas the ricinoleated vaccine produced paralysis in 10 days.

The results with phenyl-mercurinitrate vaccine were much better, probably because of less attenuation or destruction of the virus, since a 1:80,000 concentration was employed. Not only did both monkeys receiving the 0.5 c.c. dose escape infection, but also 1 receiving the 0.25 c.c. dose, while the second animal receiving this amount did not develop paralysis until the 21st day after intracerebral injection with virus. Furthermore, a monkey inoculated intracerebrally with 0.3 c.c. of this vaccine developed paralysis on the 9th day, indicating that phenyl-mercurinitrate in the amount employed produced no further attenuation of the virus than that produced by sodium ricinoleate.

The results have shown that the addition of 1:4,000 formalin to the vaccine results in so much destruction of virus as greatly to reduce its immunizing value. The same was found true but to a lesser extent with vaccine carrying 1:100 phenol. In other words, it would appear that approximately twice the smallest amounts of these agents required for the destruction of staphylococci and colon bacilli in

ricinoleated vaccine produce too much destruction or attenuation of the virus for effective immunization. It may be that larger amounts of these vaccines than those employed may produce some degree of immunization, but certainly not in the doses employed which, however, were highly effective with the ricinoleated vaccine.

Best results were observed with phenyl-mercuri-nitrate. Its addition in 1:80,000 dilution to ricinoleated vaccine appears sufficient for bacteriostatic and bactericidal purposes, although even this small amount may very slightly reduce the immunizing capacity of the vaccine. Mercurophen and merthiolate rank second, but must be used in a concentration of 1:40,000 and this amount more definitely reduces vaccinogenic activity. It is likely, however, that this reduction can be overcome by making the doses slightly larger than those employed with the plain ricinoleated vaccine and that carrying 1:80,000 phenyl-mercuri-nitrate. In general we believe that the results confirm the observations of others and ourselves that the maximum of immunization is to be obtained with vaccines showing the minimum destruction or attenuation of the virus.

The plain ricinoleated vaccine in the doses employed [5] produces only slight local reactions at the sites of injection. In several instances where marked local reactions have followed the subcutaneous injections we have found the vaccine contaminated with staphylococci or colon bacilli. By dispensing the vaccine in individual doses the possibility of such contamination can be greatly reduced, but when dispensed in vials carrying multiple doses contamination may occur, since the 1 per cent concentration of sodium ricinoleate in the vaccine possesses very low bacteriostatic and bactericidal activity. For this reason we now prepare the vaccine with 1:80,000 phenyl-mercuri-nitrate and use it in the same doses as recommended for the ricinoleated vaccine, since the immunizing value is almost the same. Furthermore, the local reactions at the sites of injection are very slight, since this amount of phenyl-mercuri-nitrate does not appear to produce additional irritation.

VIRUS OF LYMPHOCYTIC CHORIOMENINGITIS IN RELATION TO THE VACCINE

In August, 1934, Armstrong and Lillie [2] described a neurotropic virus in monkeys, encountered during the experimental transmission of encephalitis virus from the 1933 St. Louis epidemic and which was designated as the virus of lymphocytic choriomeningitis. Subsequently Armstrong and Wooley [3] found this virus in stock monkeys and suggested that it may affect man, since 2 of their strains were possibly of human origin. In the opinion of Armstrong and Dickens [4] the symptom complex is apparently a disease entity, producing in human beings the symptoms and spinal fluid changes commonly designated as "acute aseptic meningitis" characterized by headache, fever, and meningeal irritation, with cerebrospinal fluid under increased pressure and showing an increase of cells above 50 (lymphocytes dominating), coupled with normal chlorid, sugar, and urea content, a negative Wassermann reaction, and ending in recovery with a neutralizing antibody in the blood. Mice and guinea pigs have been found susceptible to the virus upon intracerebral injection with spinal cord and brain from monkeys, the disease appearing in mice in from 7 to 12 days after inoculation, and producing convulsions with death.

Whether or not this is a new virus occurring in normal healthy stock monkeys or a virus in relationship to that of encephalitis lethargica of human origin awaits further investigation. Fortunately, as shown by Arm-

strong and his colleagues, its presence in the brain and spinal cord of monkeys can be determined by intracerebral injections of these into mice and guinea pigs, and during the past 8 months we have routinely tested the brain and spinal cord of each poliomyelitic monkey in this manner before using the cords in the preparation of vaccine.

It has been our custom to inoculate mice and guinea pigs intracerebrally with 0.03 c.c. of a 20 per cent suspension of brain and cord from each monkey, and to keep the animals under daily observation for 2 to 3 weeks. Our *Macacus rhesus* monkeys have been obtained from India and are kept under observation for about 2 weeks before inoculation with poliomyelitis virus. We have purposely kept out of the laboratories all other viruses. Up to the present we have not encountered the virus of lymphocytic choriomeningitis in a single brain or spinal cord from 84 consecutive animals, but will continue to test the brain and cord of each poliomyelitic monkey before preparing the vaccine. In this manner we believe that the danger of carrying this virus over into the poliomyelitis vaccine is removed.

IMPROVED METHOD OF PREPARING THE VACCINE

The details of preparation are as follows:

1. Healthy adult *Macacus rhesus* monkeys weighing from 4 to 5 kg. are employed.

2. The animals are kept in quarantine for 1 to 2 weeks before inoculation, preferably in isolated quarters removed from contact with other animals.

3. No one is allowed to come in contact with the animals except members of the staff, in order to reduce to a minimum any possible contamination.

4. Each animal is inoculated intracerebrally (frontal lobe) with 0.5 c.c. of a 5 per cent emulsion of monkey poliomyelitic cord (Rockefeller Institute strain) under ether anesthesia. This carries about 10 minimal infective doses.

5. Symptoms of poliomyelitis usually develop in from 7 to 10 days. Immediately after death, or when paralysis is very severe, the hair is sprayed with 5 per cent tricresol solution and the skin over the head and back removed. The cord is then removed under aseptic conditions, briefly washed in 1:1,000 water solution of mercurophen or metaphen followed by sterile saline solution and placed in a 50 per cent sterile solution of chemically pure glycerin in saline solution. The animal is then carefully autopsied for any evidences of tuberculosis. If lesions are found the cord is discarded.

6. Then 0.03 c.c. of a 20 per cent suspension of cord is injected intracerebrally into each of 2 mice; a similar amount of brain is injected into 2 additional mice. The animals are kept under daily observation for 14 days for any possible evidences of infection with the virus of lymphocytic choriomeningitis.

7. Two or more cords kept at least a week in the glycerin are used in the preparation of vaccine by thoroughly emulsifying 8 gm. in 100 c.c. of 1.6 per cent sterile saline solution.

8. After fine-mesh filtration under aseptic conditions there is added an equal volume of 2 per cent solution of sodium ricinoleate carrying 1:40,000 phenyl-mercuri-nitrate prepared as follows:

Sodium ricinoleate (William S. Merrell Co.)	20 gm.
Distilled Water	950 c.c.
Boil for 10 minutes and add:	
Phenyl-mercuri-nitrate 1.2,000	50 c.c.

This gives a 4 per cent suspension of virus in 1 per cent sodium ricinoleate and 1:80,000 phenyl-mercuri-nitrate in physiological saline solution.

9. If mercurophen is employed there is added to the 8 per cent suspension of virus an equal volume of the following solution:

Sodium ricinoleate (William S. Merrell Co.)	20 gm.
Distilled Water	950 c.c.
Boil for 10 minutes and add:	
Mercurophen 1:1,000 Aqueous solution	50 c.c.

This gives a 4 per cent suspension of virus in 1 per cent sodium ricinoleate and 1:40,000 mercurophen in physiological saline solution.

10. The vaccine is thoroughly shaken and placed in an incubator at 37° C. for 24

hours and then in a refrigerator at 10° to 12° C. for 10 to 14 days with daily shaking for a few minutes.

11. A culture of 0.5 c.c. of the vaccine is then made in 200 c.c. of broth and incubated 3 to 5 days. A mouse is also inoculated intraperitoneally with 0.5 c.c. and kept under observation for a week for any possible evidences of tetanus infection.

12. If sterile, the final test consists in the intracerebral injection of a monkey with 0.3 c.c. of the vaccine under ether anesthesia. The animal must develop some paralysis within 3 weeks. If not, the vaccine is discarded as containing virus too much attenuated and therefore too low in immunizing value for administration.

13. If sterile and containing attenuated virus, the vaccine is dispensed for administration.

14. The vaccine should be kept in a refrigerator, but even at room temperature shows no appreciable reduction in immunizing value over periods of 1 or 2 weeks. Therefore it can be shipped under ordinary conditions without the necessity of being frozen or kept at a very low temperature.

DOSAGE OF VACCINE

The dosage of the improved vaccine according to age is the same as originally advised[5] being as follows:

Under 4 years	0.25, 0.5 and 0.5 c.c.
4 to 10 "	0.5, 0.5 and 1.0 c.c.
11 to 15 "	0.5, 1.0 and 1.0 c.c.
Adults	0.5, 1.0 and 2.0 c.c.

These amounts are given by subcutaneous injection at intervals of 7 to 10 days. As is true of other vaccines, adults may show more local reaction than children and for this reason we recommend giving the third dose by injecting 1 c.c. in each arm at the same time.

ATTENUATION OF THE VACCINE

Since the vaccine contains living remote monkey passage virus the matter of its attenuation and safety for human beings has been the main issue.

While the virus is highly adapted for the monkey as the result of a very large number of passages during the past many years, it is a reasonable assumption that it may have lost thereby at least some infectivity for human beings.

The subcutaneous and intracutaneous injection of the virus is occasionally followed by the development of poliomyelitis in monkeys, as shown by Flexner and Lewis in 1910. In a series of 20 monkeys the administration of 5 doses of 0.2 c.c. of a 10 per cent suspension per kg. at 5 day intervals produced the disease in 1 animal in our laboratory. But none of a series of 42 monkeys receiving the ricinoleated vaccine in doses as large as 0.5 c.c. per kg. every 5 days for 5 subcutaneous injections has developed the disease. Under the circumstances we have concluded that keeping the cords in 50 per cent glycerol for at least a week before the preparation of vaccine, followed by treatment of the *finely divided* tissue with 1 per cent sodium ricinoleate for 24 hours at 37° C., and at least 10 days in a refrigerator at about 10° to 12° C. results in attenuation of the virus. Since the natural resistance of monkeys to intracerebral injections of virus is known to vary and especially in relation to the age and weight of the animals, it is difficult to gauge the degree of attenuation, but the intracerebral injection of 0.3 c.c. of the 4 per cent vaccine has almost invariably produced poliomyelitis in over 40 monkeys of 4 to 5 kg. more slowly than the intracerebral injection of 0.3 c.c. of a 4 per cent freshly prepared virus in control animals, and in some instances has failed to produce infection altogether over periods of 3 to 4 weeks. Under the circumstances we have concluded that the glycerin, and especially the sodium ricinoleate, produces some attenuation of the virus and that the technic of preparing the vaccine is a matter of importance in this connection. Furthermore, the addition of 1:80,000 phenyl-mercuri-nitrate or 1:40,000 mercurophen for bactericidal

purposes appears to result in some slight additional attenuation.

We believe therefore that the vaccine is safe when prepared as described, due to some attenuation of the virus, the administration of a small first dose, the rapidity of antibody production, and possibly to the fact that the remote monkey passage virus used in its preparation has lost some infectivity for human beings, as more fully discussed elsewhere.[6]

SUMMARY

1. Occasional severe local reactions following the subcutaneous injection of the Kolmer ricinoleated poliomyelitis vaccine prepared by the Research Institute of Cutaneous Medicine have been found due to accidental bacterial contamination due to the low bactericidal and bacteriostatic properties of the 1 per cent solution of sodium ricinoleate employed.

2. It has been found that the addition of 1:80,000 phenyl-mercuri-nitrate or 1:40,000 mercurophen is sufficient for protecting the ricinoleated vaccine against accidental contamination without materially reducing its immunizing properties, especially in the case of phenyl-mercuri-nitrate. The bactericidal activity of merthiolate was found slightly less than mercurophen, but a vaccine carrying this amount had the same immunizing value as that containing 1:40,000 mercurophen.

3. The addition of 1:4,000 formalin required for bactericidal effects resulted in so much destruction of virus as to render the vaccine ineffective in the immunization of monkeys in the doses employed.

4. The addition of 1:100 phenol to ricinoleated vaccine produces too much attenuation (or destruction of the virus) for efficient immunization of monkeys.

5. An improved method is described for the preparation of the ricinoleated vaccine with phenyl-mercuri-nitrate or mercurophen carrying 4 per cent attenuated virus.

6. So far, the brains and spinal cords of 84 poliomyelitis monkeys have been found free of the virus of lymphocytic choriomeningitis (Armstrong and Lillie) but the method of preparation includes a routine test of the brain and spinal cord of each monkey for this virus before the latter is used in the preparation of vaccine.

7. Sterile sodium ricinoleated vaccine with or without the addition of 1:80,000 phenyl-mercuri-nitrate or 1:40,000 mercurophen, produces only slight local reactions at the sites of injection.

8. To the best of our knowledge there have been no cases of lymphocytic choriomeningitis or demyelinization encephalomeningitis due to the administration of the vaccine.

9. While we believe the vaccine must contain living virus for effective immunization in the doses employed, its safety for human beings may depend upon some attenuation of the virus by sodium ricinoleate and phenyl-mercuri-nitrate, the subcutaneous route of administration, a small first dose along with rapid antibody production and the possibility that the remote monkey passage virus used in its preparation has lost some infectivity for human beings by subcutaneous injection.

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Social Significance of Industrial Medicine*

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NO student of human affairs can fail to note the effects of social change on contemporary life. The present crisis has shaken to the roots our national existence, and touched every phase of our culture and civilization. Not only have our political and economic lives been affected, but the fundamental ideas and institutions controlling our every existence are being altered. The social structure of every nation is, therefore, being pitilessly scrutinized in a search for a solution of pressing national and international problems.

In the United States this examination has been directed toward an objective of material and spiritual security. To achieve this purpose successfully, a changed social mentality is necessary in view of the obligations of the new age. Obsolete concepts are no longer applicable in the explanation and control of modern problems. The transition of American civilization from its pioneer stage to its integrative and cultural stage, has necessitated a redefinition of established institutions and ideas.

Disease and medicine are two concepts that have a profound influence on our individual and collective welfare. The strength and health of a nation are made up of the vigor of its composite units, individuals and families. These values can only be maintained effectively by having them keep pace with the general progress in society. To achieve this goal, these concepts must be modified to fit in with the needs of the changing order.

Medicine has been defined as the science and art which deal with the prevention, cure, and alleviation of disease. As a science, medicine seeks to understand the problems underlying disease. As an art, it applies the knowledge thus gained to the solution of medical problems.

Primitive theories concerning disease were developed either from experience or from an animistic-religious point of view. The first hygienic rules were associated with the religious rites of early civilization. Following the discovery of the circulation and the scientific discoveries of the 17th and 18th centuries, disease was viewed as a biologic phenomenon due to morbid changes in life forms. This biologic aspect has been emphasized by the marked advances and discoveries in pathology and bacteriology during the 19th century. Disease then is regarded as a disturbance in the equilibrium of psychosomatic forms and functions.

The extreme difficulty, however, of studying the internal balance of the organism divorced from its environment has necessitated a new point of view.

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This view seeks to interpret the organism cosmically, and thus subject to the many interacting forces derived from the world in which it lives. In this sense the organism and its internal and external environment are considered as a whole.

Despite progress in the control of communicable disease thousands of people still die every year in all countries from preventable disease. Millions still suffer from tuberculosis in spite of our modern knowledge of its prevention and treatment. The average worker has a shorter life expectancy than the non-worker. Young children are still crippled annually by rickets, although this disease can be prevented. Thousands of women die annually from septic abortion because it is immoral to obtain contraceptive information. Such apparently unrelated factors as the curtailment of contraceptive advice and the reduction of public health budgets have a common effect in influencing the incidence and progress of disease. These inconsistencies are due to the operation of social forces.

Disease then becomes a problem of society like vice, war, crime, poverty, and unemployment. If we regard society as an organized system of human relationships, we find that its integrity is being constantly threatened by these crises. Society defends itself by calling upon safety factors within its own structure to correct the threats upon its unity. A study of the adjustment of society to its medical problems may furnish clues to the prevention, treatment, and alleviation of disease, a point of view not adequately stressed in the purely biologic approach to the problem.

Medicine then may be regarded as a social science, for both medicine and sociology as science and art have a common aim—the protection of human beings in society. The study of medical and social problems is the scientific phase. The practice of medicine and social work is the artistic. In the United States, the scope of social medicine has never been adequately defined. Broadly the term has been applied to any field of medicine presenting casual social factors.

Social medicine may be defined therefore as that field of medicine which, viewing disease as both social and biologic, attempts to determine the social cause of disease and to devise social means of prevention, cure, and alleviation. It is, therefore, a large field which covers social causation and diagnosis, social therapy and prophylaxis.

One of the contemporary leaders in the development of this science called social medicine is Zannger of Zurich, whose conception of social medicine is based on a broader idea of the subject of preventive medicine as it is taught in universities. According to Zannger, social medicine is related to legal medicine but not identical with it, and neither subject is identical with preventive medicine. His concept developed out of his experience in the scientific study of hazards in plants and industries. By studying the diseases caused by industrial activities and industrial accidents, by learning how to prevent accidents, and how to help the working class in protecting their health, he developed a new concept of social medicine from a medical point of view.

Social medicine from this point of view further notes the effects of unemployment on mortality, and the influences exerted by an occupation on the health of an individual. Social medicine studies the legislative and economic measures capable of diminishing the consequences of disease. These social phenomena are in a constant state of flux. What was true yesterday may no longer be true tomorrow. The leaders in social welfare should therefore endeavor to look into the future,

while university instruction should also take account of these facts.

From the time of Ramazzini, when he first called attention to the important relationships between conditions of work and the state of health, to the present, social medicine has gradually evolved into its present broad concept. It is now held to comprise all of social hygiene, legislation, the study of sociological, political, economic, and pedagogic factors, which permit its organization and its extension throughout the world.

There are two aspects of social medicine: first, the study of social factors as the cause of disease, and second, the use of social methods in the control of disease.

Except for industrial medicine, social factors as a cause of disease have been given little emphasis. Other environmental factors such as income, housing, and nutrition have been given superficial consideration.

Social methods in the control of disease, however, are well developed. Social medicine was born when communities were sufficiently organized to contain a centralized authority, well versed in the needs of the people and prepared to meet these needs with social defenses. These social defenses may be seen in such measures as social hygiene, socialized medicine, social insurance medicine, and medical social work.

The term "social medicine" has been frequently identified with these concepts of social hygiene, socialized medicine, social insurance medicine, and medical social work, but, as we shall see, it includes these various concepts yet is more comprehensive in its connotation.

Social hygiene, preventive medicine and public health are 3 identical concepts in the field of medicine that have been growing rapidly in importance in the last 30 years. Their theory is built up by the search for the relationship between environment and health; while in practice these disciplines promote and maintain the public health. The control of communicable disease, the improvement of water and milk supplies, the control of sewage disposal, and improved working conditions have had their effect on personal and community health. The population growth in Japan, for example, from 40,000,000 inhabitants in 1900 to 72,000,000 in 1935, is due in great part to the introduction into Japan of the western method of hygiene.

By socialized medicine is meant the distribution of medical service, so as to care for large numbers of people. This movement may manifest itself in many forms. State medicine, one of these forms, is a generic term and refers to any system of medical care provided by State salaried physicians. In its restricted and more usual meaning State medicine is thought of as the furnishing of medical care by the State to certain vocational groups of geographical areas. Physicians in the army or in Indian reservations, for example, practise State medicine.

Contract medicine, another form of socialized medicine is the furnishing of medical care by a physician whose income is fixed by contract. Such contracts are usually made by industrial and business enterprises, and the salary of the physician is more or less independent of the number of patients that he treats. Small communities sometimes engage the service of a physician on a contract basis, the doctor's income being derived either from the public treasury, through taxes levied on the potential patients, or from a fund accumulated by the contributions of the subscribers.

Social insurance medicine, which has been given some consideration in this country since the introduction of the workmen's compensation law, and the

anticipated introduction of sickness insurance schemes, is also a form of socialized medicine described above.

Through the insurance principle the economic risks of illness are distributed among the general population. In some countries such health measures exist on a purely voluntary basis; in others all citizens falling within certain income groups, are legally obliged to participate in the insurance plan.

Social medicine is frequently confused with medical social work. The latter is merely the application of social case work to medical service. Both are based, however, on the same hypothesis that disease and defect are never isolated but exist in a complex of personal and environmental conditions. Since these conditions may favor or hinder recovery they must, therefore, be taken into account in the treatment of illness.

Industrial medicine provides the only social orientation in American medicine. It recapitulates all the elements of social medicine, both theoretical and practical. On the theoretical side it studies the industrial environment as a causative factor in disease. On the practical side it employs all the measures of control found in social medicine.

In industrial hygiene we see the application of measures to control the industrial environment in order to prevent disease and maintain the health of the worker.

Socialized medicine is noted in the furnishing of partial and sometimes complete medical service by industry to its employees.

Social insurance medicine has its counterpart in American workmen's compensation schemes, where we find the economic risk of occupational illness and accident distributed among the general population by absorption in the cost of the finished product. In workmen's compensation we find represented forms of social insurance other than that of accident insurance. Sickness insurance, may be seen in the compensation for the aggravation of preëxisting disease. Workmen's compensation may appear to represent unemployment insurance, when injured workmen prolong their disability period over the stage of healing and repair. These men are being paid for being unemployed and not for being disabled. Old age insurance is represented by the fact that aged workers receiving minor injuries are frequently disabled totally and permanently because of their age and not because of their injury.

Medical social work is well developed in industry, with and without organized social welfare departments.

Thus we see how social medicine in theory and practice is applied to a large element of our population. This working group must not be looked upon as a special class, since today it forms the larger proportion of our entire population. The farmer is here also included since the mechanization of agriculture has changed the latter's status from that of a peasant to a worker.

The social significance of industrial medicine, therefore, is of extreme importance. Limited in the past to scattered services and an unimportant place in American medicine, the time has now come where its relationship to social medicine must take a more complete and definite form. This can only be done by a correlation of all the services and activities in the field of industrial medicine as it relates to the larger field of social medicine. The physician, the research worker, the university, the employer, the worker, and government must pool their resources and their efforts in creating a national fund of knowledge and practice, from which all who are dependent upon this information, must draw. Such a coordinated point of view demands an instrument for its achievement. This

instrument that I propose is a national institute of industrial medicine.

Many European countries have given expression to their appreciation of the social significance of industrial medicine by the creation of occupational disease institutes and safety museums. In our own country the National Safety Council was established for the purpose of educating the public to the importance of the industrial environment as a factor in illness, and in practical measures of controlling this environment. In the international sphere the value of a central agency for the promotion of the study of the adjustment to conditions of industrial life and labor led to the creation of the International Labour Office.

The latter exists as an international clearing house for the distribution of information with respect to the living conditions and employment of the workers. The disadvantage of that agency, however, in its application to our needs is, in the first place, that it is too remote geographically, and, secondly, there are too many political considerations which revolve upon its existence. The National Safety Council has a remarkable history of achievement; yet, its effectiveness has been limited by its narrow scope. There is, therefore, a real need for the creation of a national institute of industrial medicine in this country, designed to study the industrial environment as a cause of disease and the measures of social control to prevent, alleviate, and eliminate disease.

Such studies may be broadly classified into 4 categories: (1) the promotion of education, (2) the promotion of research, (3) the promotion of legislation, (4) the development of standards.

EDUCATION

Education in social medicine in which industrial medicine forms a large background, may take several forms. To begin with there is a dearth of studies in the medical curriculum with respect to the social sciences. It is appreciated that the present-day curriculum in medical schools is already overburdened. There is no reason, however, why such social studies as vital statistics, social hygiene, and economics, cannot be included in the premedical school years.

There is a great need for the extension of present-day instruction in industrial hygiene in medical schools. At present, of 85 medical public health schools in the United States and Canada surveyed by Bristol in 1934, only 13—10 medical and 3 public health—give separate courses in industrial hygiene; 24 medical schools add one or more special lectures in their general public health and hygiene courses; 18 schools give only brief attention to industrial hygiene; and another 21 apparently give no instruction in industrial hygiene. Regardless of the ultimate objectives of medical students, the social significance of industrial medicine makes it desirable to intensify undergraduate instruction in industrial hygiene.

There is also need for postgraduate instruction in industrial hygiene. This may take several forms: (1) specified courses of instruction in well equipped schools of public health, or specially created institutes, or (2) courses of study in large industrial centers for the practitioner who lives in a community where industrial health hazards are a special medical and social problem.

To overcome the reduction in the life expectancy of the average worker it is desirable that preventive work be promoted. While safety education in industry has achieved a phenomenal success in the reduction of accidents, health education in industry has failed completely in making the worker conscious of any responsibility in the

maintenance of his own health. The same technic that has been so successful in combating accidents, bringing the responsibility for accidents down to the lowest executive unit, the foreman, can be applied to industrial health education. It is this same technic that has made child health education successful by making the parent, the nearest executive unit, participate through the medium of Parent Teacher Associations.

Here then are 2 aspects of education in industrial medicine that require the support and development of a national advisory group: (1) the improvement of the equipment of those who protect the health of the industrial community, and (2) the education of the industrial worker in the care and protection of his own health.

RESEARCH

An important objective of a national institute of industrial medicine would be a clearing house of information. Such an institute would distribute this information by direct correspondence in answer to specific inquiries, by the publication of an annual bulletin and special reports.

A special function of this institute would be that of research. Here problems could be worked out from clinical, chemical, industrial, insurance, pathological, and other aspects. This does not mean that all phases of an industrial problem would be studied in one institute, but that research in these various fields could be directed to those agencies or institutions best equipped to carry them out. In this manner present-day mistakes could be avoided, namely, the duplication of effort, the carrying on of research by inadequately equipped organizations, and the failure to utilize properly equipped agencies already existing. The Du Pont Company today has an exceedingly well equipped laboratory, for the study of the toxocologic properties of their manufactured products. Many a manufacturer would consider himself very fortunate to be blessed with such a laboratory. The manufacturer of new products, unfamiliar with their physiological effects distributes his products today with a great deal of trepidation, in view of the rising incidence of litigation. There is, therefore, less reluctance on the part of these employers to survey the health problems involved in the manufacture of their products and also in the analysis of their physiological effects. A small manufacturer would appreciate knowing where his products could be studied at a small cost, or would even be willing to contribute to the support of such a central laboratory.

LEGISLATION

Ever since the law written on two tablets of stone was given to Moses on Mount Sinai, legislation has been an ideal for the expression and safeguarding of the common standards of life and conduct with authority to achieve a larger measure of social justice.

The control of widespread social evils, such as poverty, dependency, sickness, disability, and delinquency by social agencies and voluntary action has been very difficult. Their experience is valuable as a laboratory experiment to show the futility of such action. Such a law as Mothers' Pensions has helped to simplify the work of social agencies in the solution of the problem of dependent children and widows. Workmen's compensation has ameliorated the disabling effects of accident. Child labor laws have reduced mortality and disability and have given children greater psychological and social opportunity. All these objectives of social welfare promoted by social agencies have been achieved by legislation.

The basis of all legislation must be

accurate data. It is important that the legislator be supplied with information not only about the statute law of his own country and state, but also about the condition of the law and the course of legislation on the subject with which he deals in other countries and in neighboring states. For this purpose bill drafting and legislation reference bureaus have been established.

Some years ago the Wisconsin legislature voted a small appropriation for a legislative reference library, and a man carefully trained in history, economics, and political science was put in charge. With a small expenditure he rapidly gathered a valuable collection of reports, bills, and laws; catalogued and indexed them, so as to be at all times available. When the legislature convened he was ready to give every legislator important service and reliable information. No matter what subject a member might be interested in or what bill he might be desirous of introducing or fighting, he need not be at a loss as to what other states had done, how such legislative experiment had succeeded, and how to frame his own proposals. Bills were drafted for members at their own request and they were given hints on important points of practice and even arguments were prepared for them, if they wished.

The American Association of Labor Legislation has served in a similar but less comprehensive capacity for all labor legislation including that on occupational disease. Our own standards committee of the Industrial Hygiene Section has carried on a similar function in the field of occupational disease legislation. There is room and need for an expansion of such a service under the supervision of a national advisory group like a National Institute of Industrial Medicine.

STANDARDS

The rising incidence and costs of litigation in the field of industrial medicine, both under common law and workmen's compensation administration, has stimulated the formation of fly-by-night groups interested in the correction of the abuses arising out of this litigation. One of the most important abuses arises in the use of experts for court testimony. There is no agency fit to pass on the qualifications of those who are called as experts to testify in cases of occupational disease, be they engineers or physicians. It is desirable that such qualifications be established and that a panel of qualified medical and non-medical experts in industrial medicine be created under the supervision of this national institute of industrial medicine. Certification by this body would do much to correct one of the primary abuses in expert testimony.

SUMMARY

I have attempted to stress the social significance of industrial medicine and have suggested a device or agency the creation of which will materially assist in correcting some of the maladjustments in our present social crisis. If the conditions in which we live are to be improved and if social progress is to be realized, it must be within the system of the industrial order in which we live.

Efficiency of Methods and Products for Sterilization of Beverage Glasses*

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A SANITARY survey was made of establishments dispensing beer in Lansing, with the aim of introducing practical procedures for cleansing and sterilizing glassware. The procedure recommended is to wash the glasses free from any retained beer, using running tap water; they should then be rinsed in a disinfectant or rinsed and allowed to drain, for the recommended period of time to effect sterilization. For chlorine sterilizers, the most suitable compounds, 5 minutes is recommended. Following sterilization the glasses may again be rinsed in clean running water.

In the laboratory *Escherichia coli* and *Staphylococcus aureus* were independently introduced into solutions of various disinfectants. The numbers of organisms surviving after exposure of 15, 30, 45, 60, 90, 120, and 180 seconds and 5 and 30 minutes were determined by plate counts.

Sodium chloride and trisodium phosphate have been recommended for sterilizing beverage glasses. However, 5 per cent sodium chloride solution or 1 per cent trisodium phosphate was found unsuitable. Calgonite, a detergent containing sodium metasilicate, when used in a concentration suitable to the hardness of the water employed, was capable of destroying *Esch. coli* in 15 seconds; however, it had little or no effect on *Staph. aureus* in 30 minutes. Because of the apparent selective action of this compound it cannot be recommended as a disinfectant agent.

Klemm's Cleaner, a disinfectant, was found capable of destroying the test organisms in approximately 2 minutes. A very significant reduction was effected in 1 minute. However, this compound has questionable value because it produces an intense purple color and stains utensils.

Natraphene, sodium 2 — hydroxy diphenyl, has been suggested for the sterilization of beverage glasses. This compound when used in the recommended concentration of 1 to 1,000 was very slow in destroying *Staph. aureus* and *Esch. coli.* The retarded action of this compound with the lack of a suitable test for determining its concentration makes it undesirable.

Of the chlorine containing compounds examined those containing inorganic chlorine were found to be more suitable because of the speed of reaction. Two hundred p.p.m. is recommended. A more detailed discussion of these preparations was presented in a previous paper.[1] A new chlorine preparation, Azochloramid, was found to be comparable to chloramine T in its killing speed. The compound, like chlora-

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mine T products, may be used for beverage glass sterilization provided a sufficient period of exposure is used. This preparation has the added advantage that the yellow color produced is indirectly a measurement of the available chlorine present.

Hot water, as employed in a mechanical dish washer, has been found to be very satisfactory in sterilizing glasses. A minimum temperature of 160° F. (71° C.) should be maintained. On repeated tests all glasses examined were found to be free from organisms.

A device using ultra-violet light as the sterilizing agent was submitted for examination. The machine was designed to sterilize the rim of the glass while the glass was being filled. Laboratory tests disclosed the fact that the time required to effect sterilization of the rim of the glass was greatly in excess of the time required to fill the glass.

In summarizing these findings it was obvious that the most effective agents were hot water, and the sodium and calcium hypochlorites. Azochloramid and chloramine T were suitable providing the time of exposure was sufficiently long. While Klemm's Cleaner was found to be an effective disinfectant it was unsuitable because of other physical properties. Sodium chloride, trisodium phosphate and Calgonite were unsatisfactory.

The ideal beverage glass sterilizer is one which is not toxic to man, is not obnoxious in any manner, does not possess any undesirable physical characteristics, does not produce a precipitate, effects sterilization rapidly, and one the concentration of which can be easily determined.

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Group Payment for Hospital Care in New York

AFTER two and one-half years of study and preparation, which involved the enactment of an amendment to the insurance law of the State of New York, the Associated Hospital Service was incorporated in 1934 to undertake a plan of group payment for hospital care. The initial expenses of organization and promotion were met by grants from the Commonwealth Fund and the Josiah Macy, Jr., Foundation.

A campaign of public education undertaken by the United Hospital Fund's Department of Education has made the public widely familiar with the benefits of this "3¢ a day" plan. The public response to the plan was so enthusiastic and the approval of it so widespread, that in less than six months the quota of subscribers for the entire first year was exceeded. While the results have been gratifying, it cannot be expected that the volume of business will be sufficient for several years to appreciably affect hospital income, the plan being in no sense a money-making scheme for hospitals. It is rather a public service made available to persons of modest means by the hospitals.

Shellfish Report from the Standpoint of the Control of Shellfish in Interstate Shipments*

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IN applying standard methods for the bacteriological examination of shellfish, the food law enforcing officer has an objective quite in common with that of the sanitary engineer and the public health official who exercise control over sanitation surrounding production. Because of differences in jurisdiction and legal authority, the agency supervising interstate traffic must adopt control procedures different from those employed by supervisors of sanitation at the source of production. If a method of analysis is to be useful in any plan of control of interstate commerce, it should be devised to present data essential for such control under the limitations of authority imposed by the terms of the applicable law.

A brief sketch of the methods of control possible of application by agencies supervising production, and those enforcing interstate food laws will bring out more clearly existing differences of jurisdiction and authority. Since the public health officer in the producing state has ready access to the oyster growing areas he can conduct sanitary surveys of the surrounding terrain, examine bacteriologically the waters in the growing areas and inspect shucking houses. In conformity with compliance, or non-compliance with a sanitary code, the public health officer may grant or refuse certificates permitting production or licenses allowing shipment and sale. This official has power to approve or condemn entire areas of production.

In contrast to this method of control at source of production, the organization controlling interstate shipments must proceed by the objective examination of samples collected at destination, or, at best, after the shellfish have been offered for shipment. Only in a limited manner can sanitary surveys of growing areas be made. The present federal food and drugs act contains no quarantine, or embargo power, and does not provide for the issuance of licenses, or permits. While the Food and Drug Administration, for the guidance of sampling operations, does inspect food establishments, no sanitary code for oyster shucking houses is provided. In applying the food and drugs act to oysters each shipment must be considered as a single case, and the action indicated must be based on the data available relative to the individual

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shipment. The control procedure laid down in the federal food and drugs act is a process of seizure by libel of those goods which have been found to violate the law. In the sanitary control of oyster shipments, this calls for an allegation by the government that the product is filthy, or dangerous to health, and the burden of proof then rests upon the libellant to sustain these allegations.

Therefore, it is apparent that the soundness of the analytical method becomes a vital factor in the successful control of interstate shipments which are violative of the law. A standard method of examination meeting with general approval, and presenting data interpretable in irrefutable terms of filth, or danger to health, is a weapon sorely needed by the official responsible for control of interstate shipments.

Inquiry by the Referee on Shellfish Examinations has brought forth the information that in routine practice in nearly all those laboratories to which questionnaires were directed, the present standard methods [1] are being used essentially as given, with only minor variations. This might be construed as an indication that the present standard methods meet with rather universal approval. However, certain critical reports [2, 3] on the significance of the *Bacillus coli* score, the skepticism often expressed regarding the use of only shell liquor for examination, and questions raised relative to the inclusion of so-called non-fecal members of the coli-aerogenes group in computing the score, lead to the conclusion that there is no such universal approval, and that the methods as given are often followed simply because they are designated as "standard."

The unit of measurement of pollution in oysters provided in present standard methods, and the only guide available to the analyst, should his information be restricted to the results of examination of a sample, is a score arrived at by an arbitrary numerical system based on the prevalence of all members of the coli-aerogenes group. It is known that in addition to the amount of pollution present, the score is affected by hazards of sampling, seasonal variation in the bacterial content of oysters, methods of handling, and vicissitudes of transportation. It must be borne in mind that the analyst functioning in the enforcement of food laws obtains for his sample oysters, not taken directly from the growing areas, but from shipments which have been subjected to the influencing factors mentioned. It has been generally accepted that bacteria of the *B. coli* group do not tend to multiply in shell oysters after removal from the water if the oysters are maintained alive. However, reports not infrequently made of high scores, at shipment destination, in oysters from approved areas serve to confuse the administrator and becloud the significance of the score. In most cases the score, as determined in the present standard methods, for the purposes of control of interstate shipments, must be supplemented by information regarding sanitary conditions at source of production, and by some knowledge of the conditions of handling. The need for such information, which may not always be at hand, may result in embarrassment in the effectual carrying out of the purposes of the law. This condition indicates the necessity for some more definite means of measuring pollution than is prescribed in the present system of scoring.

The interpretation of the *B. coli* score on shucked oysters examined at shipment destination presents a particularly vexing problem. Recognizing that shucking operations and shipping conditions tend to disturb any correlation that might exist between *B. coli* score on shucked oysters and sanitation of the growing areas, it is extremely difficult to translate the score obtained

by present methods at destination, into terms of potential danger to health. It is particularly important that this phase of shellfish examination be given attention and study. Since shucked oysters are invariably shipped under refrigeration, which, if properly conducted, should provide temperatures below 50° F., it is possible that a differential score, based on the prevalence of fecal *B. coli*, may have greater significance than does the score determined by the procedure given in the present methods.

Standard methods [1] recommend the discontinuance of the determination of total counts of bacteria in the shell liquor. Perry [3] has shown that total counts are a better index of cleanliness in handling than is the *B. coli* score on shucked oysters when determined at the shucking house. From the standpoint of the control of interstate traffic, however, total counts, because of their variability and wide range, when determined on samples from shipments, cannot be relied upon to serve as sole evidences of unfitness. If determined as an optional procedure with shucked oysters, they may provide the food control official with some evidence regarding the general cleanliness of the product.

Legal actions under the present federal food and drugs act against shipments of polluted oysters must be based on charges that the product is filthy, or dangerous to health. In considering the sufficiency of analytical evidence to substantiate such charges, a question arises regarding the interpretation to be placed on the presence of the various members of the coli-aerogenes group. There should be no controversy concerning the significance of organisms confirmed as fecal *B. coli*, whereas there may be almost unlimited argument relative to the significance of other bacteria of the group. Therefore, in determining a course of action following the accumulation of analytical, as well as inspectional data, it is decidedly advantageous to have at hand some figures to express the incidence of fecal *B. coli* in the material under examination. The acquisition of such information would involve certain technical procedures additional to those now prescribed in standard methods for identification of members of the coli-aerogenes group. Furthermore, it would be necessary for standard methods to define what is meant by "fecal" *B. coli*. It is not difficult to identify, on the basis of colony formation, bacteria of the Aerobacter, or aerogenes section of the group. Although attended with more difficulty, it is possible, with experience and practice, to distinguish on eosin-methylene-blue agar colonies of the so-called *B. coli* intermediates. Bearing in mind that, in taking legal action against interstate shipments, the burden of proof of a charge of filth and potential danger to health rests upon the food law enforcing agency, examination should disclose conclusive evidence of the presence of strains of intestinal origin. The significance of *B. coli* intermediates in this connection will require clarification. In emphasizing the need for differentiation of the coli-aerogenes group, it is not suggested that a score, or other numerical expression based on the group, be abandoned. Such data, considered in connection with inspectional evidence, are informative and should be of value. However, in regulatory control of interstate shipments scores based both on the group and on fecal *B. coli* at present seem desirable.

In the history of the present standard methods, a particularly controversial point has been the question of whether oysters showing a score higher than 50 should be condemned. From the standpoint of interstate control, little need be added to what has already been stated in this paper on this subject if the score is based on the presence of

all members of the coli-aerogenes group.

A procedure commonly followed in the sanitary control of oyster production involves the bacteriological examination of the waters in which oysters are grown. Attention may again be directed to the fact that in interstate control such procedure can be applied only in a very restricted manner, and only in those instances where the food control official may have access to the growing areas. Directions for making such examinations very properly belong in any procedure laid down for the sanitary control of production, but their presence in any set of directions for the bacteriological examination of shellfish would tend to confuse. If the report of the shellfish committee goes so far as to include recommendations for the sanitary control of growing areas, procedures for sea water examinations may quite logically be included. On the other hand, if standard methods are to be drawn up as a guide to the food analyst, methods for the examination of water would seem to have no proper place.

The present standard methods give directions only for the examination of oysters. Clams and other mollusks require attention, and thought must be given to the question of whether an attempt should be made to formulate one method for all shellfish or whether distinctive methods for various shellfish should be devised. Gorham,[4] in his last report as referee on shellfish examination, recommended that a subcommittee be appointed to draw up methods for the examination of clams, mussels, and other shellfish. The anatomy and habits of various mollusks differ sufficiently to make it difficult to formulate one method capable of application to all bivalves. Too little is known regarding the bacteriology of clams in relation to their environment, to predict at this time whether or not it would be possible to include in one method a procedure for the examination of all shellfish.

This paper does not include a discussion of details of technic to be followed in standard methods. Whether the practice of examining only the shell liquor should be abandoned in favor of an examination of oyster meats, or the entire shell contents, and whether the present system of scoring should be abandoned for some other form of numerical expression of results, are matters of laboratory method discussed by others. The purpose of this paper has been to present some comments regarding limitations of usefulness of the present standard methods from the standpoint of interstate control of shellfish, and to make some suggestions as to special lines of study to meet the needs of the food law enforcing officer.

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The Psychologic Factors of Health Education*

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IN health education the principal elements are: (1) the educator, animate and inanimate; (2) the thesis and act of education; and (3) the object to be influenced, *i.e.*, educated.

These elements have a variety of other names. Thus, the educator (animate and inanimate) is also termed tools or instruments; the thesis and the act are termed the content and methodology; the object to be influenced, the audience.

In all crafts and arts—and health education may be considered such—effectiveness calls for a knowledge of the nature and competencies of the tools, an appreciation of the character of the design, and an understanding of the quality of the material to be fashioned. As these are fully understood and adapted to each other, so will the end result tend to approximate perfection.

In our craft, that of health education, there is a great deal of simple technology to be mastered. A knowledge of the competencies and nature of our tools, the spoken word, the printed word, the ideogram, and all their modifications, calls for wide excursions into the technics of public speaking, printing, types, paper, layout, color combinations, drafting, etc. In the field of the technologies the notable achievements of the Routzahns are to be signalized. But in addition to the fundamental and all-essential technology, there is also in our craft a large need for psychologic understanding, for our ultimate goal is to influence behavior—dynamically or statically, and the influencing of behavior through the means of persuasion, is essentially a psychologic achievement.

For this reason we must, as we have only lately begun to do, apply ourselves to an understanding of the psychologic implications of the 3 principal elements.

Of the first element, the instruments of education, I will say little if anything. The subject is too large to be epitomized. However, it is essential for effectiveness, to know the nature and competencies of each tool, for, as the wise Goethe said " Who on efficient work is bent—must use the fittest instrument," and it is folly to cut butter with a butcher's saw, or to tickle gristle with a butter knife.

The second element, the thesis and act, commonly designated as the content and methodology, has a very distinct psychologic prerequisite, and to this I have devoted a good deal of consideration.

Let me here give but the briefest of summaries, referring the reader to the

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fuller expositions contained in separate papers.*

The methodology of health education, to which content is reciprocally fitted, has the following aims and requires these psychologic observances, namely, we must first arouse curiosity, that is, deflect or direct the stream of consciousness, awareness, and attentiveness of our audience, single or multiple, from the bedflow of its own direction into that which we desire; second, we must enlist sympathy, that is, relate our objective to the egocentricity of our audience, make them (or him) realize the intimate pertinence of the matter dealt with and the goal aimed at; third, we must impart information, *i.e.*, fit into the audience's rational scheme of things—the what and the wherefore of our objectives, thereby incidentally also making an appeal to its emotions by way of intellect, for, be it noted that all men are eager to be considered rational beings.

Fourth and finally, to lead to action, that is, to tie our objectives to the innate emotional motives and psychologic drives of the individual and thus to achieve ultimate realization of our objectives.

These 4 essential psychologic prerequisites are not to be attained in abstraction. They are essences, but they are expressed and they are affected, in quality and degree, by the nature of the instruments employed, by the skill exercised, and most by the qualities of the audience, *i.e.*, of the object to be influenced.

AUDIENCES DIFFER

Audiences differ, and as they differ their psychologic character and susceptibilities differ. Not only do audiences vary in the gross and evident categories of economics, education, and social level, but also according to race, religion, geographic origin, etc. These are obvious differences, fairly widely appreciated. Less so appreciated are the psychologic variations of the same body under different circumstances and in different environments. The mother at home and at a parent-teachers meeting, are two different individuals in whom different psychologic and emotional potentials predominate. So, too, differs the business man when in his office and when fraternizing as "Bill" at the Service Club. The common man is psychologically one mortal in his shop, another in his trade union, club, etc., and still a third in his church.

The psychologic considerations which center about economics, education and social differences of our audiences are essential, but, in themselves, all too limited to accord us an adequate picture.

There are numerous other factors which we must consider.

PRIDE AND PREJUDICE

Each and every type of audience has its singular prejudices.

When the legions of Julius Caesar threatened to revolt, he addressed them as "quirites"—Roman citizens. They objected, we are not "quirites" but "milites," not citizens but soldiers, Roman soldiers. Caesar's rejoinder was in effect "I'd hardly think so by your actions," and the issue was won in no small part by Caesar's knowledge of his soldiers' prejudices.

Again, the facetious story is told of an old Jew on the witness stand, who, when asked his age, suddenly grew deaf and heard not. To all the interpreter's refashioned inquiries, the old Jew replied with an inquiring "Ah?" Then up rose another Jew who knew the old man's superstition, and, with the permission of the court, phrased the inquiry thus: "Rebbe, may you live to be 120, how old are you?" The formula having

* The Psychophysics of Health Education.

been observed, the Jew suddenly heard again, and replied "eighty-four."

SPEAK THE "LANGUAGE" OF THE AUDIENCE

Every audience speaks its own language. And may it be noted here that language varies not only according to the multiples of syllables in the words used, but more so according to its phrase form and its picture content. Too many among us identify monosyllabic words with clarity and simplicity. One can be muddle-headed in the language of the Testament and crystal clear in the iridescent language of a Santayana.

A STORY WILL ILLUSTRATE THE POINT

A Russian village needed a new minister and 3 elders were sent to interview a likely candidate—a tailor, a blacksmith, and a teamster. Each was much impressed with the aspirant and they reported thus to their congregation.

Said the tailor, "Aye, he is gifted—sharp as a needle, substantial as a worsted, smooth as an even stitch. He will suit us as a perfectly fitted garment."

Spoke the blacksmith, "He rings as true as the fair blow of the hammer on the anvil; the fire of the forge smoulders in his breast, blown upon by the bellows of zeal. He is blue steel, my brethren."

Then joined in the teamster, "He has the spirit of a young stallion, the earthly will not rein him, for the spur of fervor is ever in his side."

These 3 told the same tale but they spoke differing languages. If we would be understood by the "tailor," the "blacksmith" and the "teamster," we must speak their respective tongues.

WORK NOT AGAINST THE GRAIN

Every audience has its grain—and the skillful educator avoids working against it. The Irishman's respect for his church, the Italian's code of paternal authority and his moral scruples, the Jew's exquisite alertness for evidences of racial prejudice, the (Northern) Negro's "chip on the shoulder" attitude, the broad suspicion in every group toward the strangers "bearing gifts," are psychologic realities, which, no matter how we evaluate them, we must recognize and allow for in our calculations.

MIDWIVES TO IDEAS

Socrates, in one of Plato's dialogues, speaks of himself as a midwife to ideas. This is a happy simile, and one which we can contemplate with benefit. For are we not all aiming to serve as midwives to ideas; and, if so, ought not we to know something of obstetrics? Surely we could benefit by observing the ways of nature which, in the process of birth, are slow measured, and minimal in violence.

In our services as accoucheurs to ideas, as educators, if you please, we must not force matters. No meddlesome obstetrics, only natural births achieved in the proper tempo.

To take this consideration out of the realm of abstractions and of similes and to illustrate its concrete application—consider for example, the reëducation of certain foreign elements in the art and science of good dietetics. The Italian eats certain foods in certain combinations. These foods, in their particular combination, may or may not have been good or ideal in native Italy; certainly, they are not good here. Now they must be changed: an idea is to be born. May the midwife be gentle! If violence is applied, the event will be miscarried—if the Italian is urged to abandon his major affections, his bread, his spaghetti, his other farinaceous foods, his spices, wines, and condiments, he will turn a deaf ear and an unresponsive mind. But if,

by the gentle art, he is persuaded in terms of his own edibles to recombine them in better proportions, to add to them, in other words, to build upon what he accepts a new acceptable dietary, then there is promise of the healthy birth of an idea, wholesome, sound, viable.

But forceful obstetrics in the realm of ideas is not limited to dealing with the foreign born. We have an outstanding instance in the case of the now almost abandoned movement for the periodic health examination. This is not the place to analyze that most interesting phenomenon, nor will I attempt to evaluate its intrinsic worth. I mean but to cite this as an instance in which "high forceps" were applied to something that would not be born.

The moral of this consideration is that we must not urge upon our audience anything beyond its capacity to understand, appreciate, or to act upon. Be it noted, however, that *capacity*, and not immediate readiness is the criterion.

PROFITING BY LIMITATIONS

This list of audience peculiarities which we have cited must not be construed as total disabilities. Prejudices, superstitions, sensitivenesses, are, to those skilled in their utilization, free avenues of approach, and long levers for manipulation. The individual who is sensitive about his religion is by the same token acutely responsive to an encyclical letter from his bishop, and if you can enlist the churchmen of your realm in your educational campaign, you have found the toadhead's jewel.

The Italian's very patriarchal bias makes him an obedient and responsive son of his intellectual or social elders—the learned Italian journalist, jurist, doctor, or banker exercises a strong influence over his countrymen. The Italian's lodge, his native-tongue newspaper, and his priest will serve to circumvent his suspicion and to gain his sympathy.

Call upon the Negro to measure his achievements with his pretensions and you have harnessed his understandable obstreperousness. Call upon him to help himself and he cannot but struggle to respect himself. *Noblesse oblige* holds for all levels of nobility even unto the plain man's.

THE PRINCIPLE'S THE THING

It were possible to catalogue many other and similar points bearing on the psychologic variants associated with various audiences but the list could hardly be exhausted in a lifetime study, and its worth is questionable. The principle is the thing. First, the full awareness of the fact that the recipient of our educational efforts has a unique psychologic nature which in a large measure must affect our dealings with him, is the starting point from which we take direction. Failing in this, we are in great risk of getting nowhere. Second, the unique psychological nature of our audience has its taboos and its susceptibilities—not infrequently the one is the other depending upon the compass of approach. Those skilled in the exploration of the psychologic susceptibilities of the group, may even in the face of honest protestation praise Caesar in burying him.

HOW IT CAN BE DONE

Perchance at this point the task may appear overwhelming. One may ask how can a man undertake to serve as teacher when he must first enter into the depth of his pupil's conscious and unconscious being, and not only fathom his pride but also his prejudice, learning to evade what will offend and to court both his weaknesses and his strengths. The task were indeed hopeless were it not that we have wise and ready allies, whom, alas, we use but seldom. Learning were next to im-

possible if each of us were required to wrest its elements from our single lives and experiences. But Euclid having conceived and tried his theorems on the banks of the Nile, has taught all generations to measure the lay of the land. We may not play Euclid in any realms of knowledge, but in most we shall find at least one well informed and eager to enlighten us. If you would know your group, gain insight into its character, learn of its psychologic bias —deal with one of its own who is outstanding in his group, one who is, so to say, a "liaison personage" between your group and his. The priest or minister, the political leader, the journalist (this one a most valuable ally), the doctor, lawyer, educator, and leading business man, the socially prominent woman, these, if you take them into your counsel, will teach you in brief what you could hardly gather in half a lifetime of application.

Above all, bear in mind the similar dissimilarity of mankind. Bread is the staff of life and yet how different the breadstick of the Italian from the pancake loaf of the Armenian. And though each is bread, still will the one be eschewed in preferment to the other—one's own bread. It is for us to be mindful of men's preferments in instruction as in bread.

Toward Prevention of Suicide

SEVEN prominent psychiatrists and three social workers who believe, according to the press, that "the phenomenon of self destruction should be treated as a preventable disease," have formed a committee of research into the motives and impulses that lead to suicide.

A Committee for the Study of Suicides has been incorporated in New York, "to study and conduct research with respect to and to collect, edit, classify, complete and disseminate knowledge, information, data, facts and statistics concerning the history and causes of, motives for and ways and means of prevention of suicides."

The directors of this new committee are:

Elizabeth G. Brockett, social worker, New York

Marshall Field

Dr. Gerald R. Jamieson, psychiatrist, New York

Dr. Herman Nunberg, psychiatrist, New York

Dr. Henry Alsop Riley, professor of neurology and psychology at the College of Physicians and Surgeons, Columbia University

Dr. Dudley D. Shoenfeld, adjunct psychiatrist and chief of the Mental Health Clinic at Mount Sinai Hospital

Dr. Bettina Warburg, formerly of the staff of Bloomingdale Hospital, White Plains

Dr. Gregory Zilboorg, psychiatrist, New York

Dr. Franklin G. Ebaugh, of Denver, director of the division of psychiatric education of The National Committee for Mental Hygiene

Barklie McKee Henry, president of the Association for Improving the Condition of the Poor

The secretary of the committee and director of research is Dr. Gregory Zilboorg of New York.

Water Pollution Abatement in the United States*

H. R. CROHURST
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THE report of the President's National Resources Board, December, 1934, provided the basis for a comprehensive long range national policy for the conservation and development of our national resources.

The Water Planning Committee of the Board made the following recommendations relative to water pollution:

> That a permanent water planning section of the National Resources Board, or its successor, be established to assemble promptly the basic data which now exist in scattered places and are needed for planning the use of water.
>
> That it initiate whatever researches are needed for additional data.
>
> That it investigate water pollution in all its phases, including the effect of pollution on fish and other forms of aquatic life and organisms.

The recognized trend of public opinion toward dependence on federal regulation, as a cure-all in water pollution abatement, indicated to the National Resources Board the necessity of assembling promptly, as a criterion for sound future policies, a more dependable inventory of the status of several specific aspects of water pollution than had previously been undertaken.

To obtain this specific information and to carry out the recommendations of the Water Planning Committee, a Special Advisory Committee was appointed December, 1934, to assist the Water Resources Section in making an inventory of the present status of water pollution and control; recommend needed research studies to obtain lacking information; and formulate general future policies for the control of water pollution.†

The writer presents in this paper a review and abstract of the report of the above committee, with which he was associated in its preparation.

The committee assembled its basic information upon which to base its recommendations of future policies in water pollution control:

1. Through correspondence (supplemented in some cases by personal interviews) with responsible officials of all state agencies which it had been able to determine as concerned with administrative control of water pollution, such as state health agencies, conservation commissions, and fish and game commissions.

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* Read at a Joint Session of the Conference of State Sanitary Engineers and the Public Health Engineering Section of the American Public Health Association at the Sixty-fourth Annual Meeting in Milwaukee, Wis., October 7, 1935.

† The Special Advisory Committee consisted of the following members:

W. B. Bell, Bureau of the Biological Survey, U. S. Department of Agriculture

Lt. Col. Glen E. Edgerton, Office of Chief of Engineers, U. S. Army Engineer Corps

A. C. Fieldner, Bureau of Mines, U. S. Department of the Interior

Elmer Higgins, Bureau of Fisheries, U. S. Department of Commerce

Thorndike Saville, Assoc. Dean, College of Engineering, New York University

R. E. Tarbett, Bureau of the Public Health Service, U. S. Treasury Department

Abel Wolman, Chief Engineer, Maryland State Department of Health

2. Through a Joint Committee of the American Society of Civil Engineers and the American Institute of Chemical Engineers, under the chairmanship of S. T. Powell, with respect to the treatment of industrial wastes.

3. Through Sanitary Engineer H. W. Streeter, U. S. Public Health Service, on the status of standards of water as applied to pollution.

4. Through Dr. M. M. Ellis, Bureau of Fisheries, on water purity standards for the maintenance of aquatic life.

5. Through the State Planning Consultants and the Regional Water Consultants of the National Resources Board.

The report of the Special Advisory Committee presented a summary and digest of the data accumulated from their investigation under the following main divisions:

A. Status of water pollution legislation
B. Status of water pollution from public health aspect
C. Status of water pollution from biological aspects other than public health
D. Status of industrial waste pollution
E. Status of standards of water quality
F. Economic aspects of pollution
G. Recommendations

The committee reached certain general conclusions in respect to water pollution control, which may be briefly summarized as follows:

A. STATUS OF WATER POLLUTION LEGISLATION

Federal legislation — State agencies in general are opposed to any extension of federal regulatory authority with respect to water pollution control. They favor the federal government's confining its activities to investigation and research and to acting as a coördinating agency.

While federal regulatory authority over the control of water pollution is subject to constitutional limitations, it may nevertheless be broadened by Congress.

The interstate compact as a means of dealing legislatively with interstate problems is a relatively little used method of regulating water use. While its limited success hitherto might argue against its employment, the possibilities of the interstate compact as applied to water problems has not been adequately tested. Therefore further consideration must be given to such compacts as an aid to the solution of the problem of pollution administration and control.

The conclusion seems inevitable that, although interstate compacts offer a hopeful means of abating pollution of interstate streams, something more is necessary to make them effective. It appears there is a real desire by state agencies that the federal government should act in guiding and stimulating, and in an advisory capacity. Such action would be in accord with precedent and would promote conditions which would guard against discrimination between local interests and between interests of separate regions.

State legislation—Certain changes in existing state laws are needed if more effective control of pollution is desired. These should include:

a. Adequate administrative control.

b. Delegation to the administrative agency of the power to determine what constitutes that pollution which is prohibited by the statutes, and to establish limits of pollution.

c. Mandatory power to compel installations of works and other necessary action.

d. No limitation on taxing power of municipalities in application to works ordered by the administrative agency.

e. Power to require the provision of facilities through sewerage or sanitary districts or otherwise, to enable municipalities and industries to comply with the law.

B. STATUS OF POLLUTION FROM PUBLIC HEALTH ASPECT

Some progress in the provision of sewerage systems and sewage treatment plants is revealed. The conclusion is also evident that the unsatisfactory progress in sewage treatment is not entirely explained by lack of

legislation, personnel, and funds in the administration of water pollution control.

On the basis of returns which are admittedly incomplete, the following estimates are ventured.

Public sewer systems are estimated to be available to 56 per cent of the total population of the United States; that is, to about 68 million persons. The great majority of the urban population has access to such systems.

The sewage from approximately 28,400,000 persons, about 41 per cent of the urban population, is estimated to receive treatment; that from 14,600,000 persons, 21 per cent of the urban population, is estimated to receive both primary and secondary treatment. This suggests a population of some 40,000,000 persons in urban communities disposing of sewage with no treatment prior to discharge. Not all of this sewage would require treatment, but a considerable portion undoubtedly would.

In most states, present law, administrative personnel and funds are entirely inadequate. In a few states such provisions are excellent. Even in these few more fortunate states, progress toward the abatement of pollution has been unsatisfactory. The basic causes of lack of progress lie in public apathy and in the cost of remedial measures rather than in lack of legislation, personnel, and administrative funds.

C. STATUS OF POLLUTION FROM OTHER THAN PUBLIC HEALTH ASPECTS

A survey of pollution inimical to fish, waterfowl, and other wild life indicates losses of large but indeterminate proportions. The collection of precise data on these intangibles and indirect damages is difficult, as in most states no comprehensive survey has been made. Despite the great interest in sportsmen's organizations, insufficient action has been taken to abate nuisances and abuses, or even to appraise the nature and extent of the effect of pollution on fish and bird life.

In this instance also general public interest is lacking and a sound and thorough educational campaign appears advisable. A complete examination of the entire pollution problem from the point of view of its effects on aquatic life is necessary in order to determine upon the extent of the damage by pollution and upon the expenditures justifiable for its correction

D. STATUS OF INDUSTRIAL WASTE TREATMENT

Each industry presents its own pollution problems, that cannot be solved by general methods of sewage treatment. For many industrial wastes, practical and economical methods of treatment are available. For a limited number, feasible and economical processes of treatment have not yet been developed. In water pollution control, effort should be made toward recovery rather than toward treatment of wastes, wherever practicable. Because of the individual methods of treatment necessary, the prevention of pollution by undesirable industrial wastes demands the active coöperation of industry. That industry has not been entirely inactive in the prevention of water pollution is evidenced by the fact that, in 23 states, there are a total of 523 industrial waste treatment plants of various types, providing varying degrees of treatment for a large number of different classes of industrial wastes. The investment by industry in the prevention of water pollution in these states has been estimated at nearly $25,000,000.

E. STATUS OF QUALITY OF WATER STANDARDS

The use of standards of water quality is limited in this country and is marked by a lack of any general agreement as to what standards, if any, should be

applied to particular kinds of water utilization. With a few exceptions, there seems to be a growing sentiment favoring an effort to devise and adopt, for certain water uses, standards which may be acceptable to those who have to deal administratively with water pollution problems.

From the standpoint of regulation, it is believed that the time has come to determine limiting standards of pollution for at least certain classes of water subject to uses more or less common to the country as a whole. The success with which the application of the Treasury Department drinking water standard has aided in bringing about a general improvement in the quality of public water supplies affords striking evidence on this point.

Before any attempt can be made to formulate standards for general application, there is need for systematic and thorough study. Such studies should be comprehensive in scope and should enlist the services of experts experienced in the various aspects of water pollution and related problems.

F. ECONOMIC ASPECTS

There is an unfortunate, widespread fallacy to the effect that sewage and industrial waste treatment is or can be made self-sustaining or even profitable. The contrary is of course nearer the truth.

The reduction of pollution implies a cost to the taxpayer, measurable in amount. The economic losses to the public due to the failure of treatment, however, have not been evaluated, because very few state officials are willing to venture an estimate thereof. These economic losses are probably large, and tend to offset the cost of water pollution abatement, but at the moment no authoritative figures therefor can be presented.

Taking into account the expressed desire for additional federal coördination and the existence of a multitude of interstate problems, the whole matter of pollution abatement should be viewed in terms of regional social economy on the basis of drainage-basin units.

Inasmuch as substantial advantage would accrue to the national economy by the institution of measures for abatement of pollution, and as a stimulus to local initiative is essential, it seems wise for the federal government to assist in the financing of such enterprises.

RECOMMENDATIONS

On the strength of the data assembled, the special Advisory Committee on Water Pollution is responsible for the following recommendations as a policy for federal participation in water pollution control:

1. That where drainage area authorities exist for the comprehensive development and control of water, their scope be made sufficiently broad to include control of pollution.

2. That no basic changes in existing federal law with reference to water pollution control be made until the experimental program presented later herein shall have indicated whether or not such changes are desirable and feasible.

3. That simplification and coördination of state laws be effected to provide for the following minimum requirements:

a. Adequate administrative control

b. Delegation to the administrative agency of power to determine the nature and extent of pollution prohibited by the statutes, and to establish limitations of pollution

c. Appropriate mandatory powers, particularly the power to compel the installation of essential remedial works and force other necessary action

d. No limitation on the taxing or bonding power of municipalities, when applied to remedial works ordered by the administrative agency

e. Power to require facilities through sewerage districts, sanitary districts, or otherwise, that will enable municipalities and industries to comply with the law

4. That broader authorization for research be granted to those agencies of the federal

government which are already concerned with various phases of the problem, and that adequate funds be provided for properly coördinated water pollution investigations.

5. That powers and funds be granted to an appropriate federal agency to institute a coöperative program of investigation with legally constituted state agencies for such special studies as appear desirable, and particularly for the development of appropriate standards for water use and control.

6. That in order to stimulate the construction of pollution abatement works, funds for the purpose be made available by the federal government to local public and private agencies on a grant-in-aid or loan basis. Lacking any precedent for the designation of appropriate bases for such allocations, the committee recommends the creation of a demonstration unit on a river system selected for that purpose.

Lacking any precedent for the establishment of the bases for such allocations, and for federal coöperation in a program of pollution abatement, the committee recommended the creation of a full-scale demonstration unit on the Potomac River, an interstate stream of some magnitude, involving the mutual interests of four states and the federal government, to demonstrate the possibilities of: (a) better coördinated stream pollution control legislation in the states, (b) more adequate administrative procedures by state agencies, (c) the development of the legal and administrative procedures for regional or metropolitan pollution abatement authorities, (d) the coördination of municipal sewage disposal projects with state-wide or interstate projects, (e) the solution of additional industrial waste treatment problems, (f) the extension of coöperation with industry, (g) the stimulation of public demand for the adequate control of stream pollution.

For the general administrative control of this drainage basin, the committee recommended a board of 5 members, 1 appointed by the National Resources Board and 1 appointed by the governor of each of the four states comprising the drainage basin, with the approval of the National Resources Board. It further recommended that the present Advisory Committee act as the directive agency to consult with and keep informed of the activities of the Administrative Board.

The Administrative Board should be empowered to employ technical personnel; undertake investigations of scientific nature, negotiate contracts with municipalities, counties, states, and private industries; assist in the preparation of plans and specifications for works projects; and develop financial programs for accomplishing the objectives outlined.

The committee estimated the cost of the proposed Potomac River demonstration project at $15,000,000, and submitted detailed estimates of the various items of expense.

Promotion of Certified Milk

A NATIONAL campaign to promote greater use of certified milk by physicians and the general public has been launched by the Certified Milk Producers' Association of America, Inc., with the coöperation of the American Association of Medical Milk Commissions, of which M. J. Rosenau, M.D., is president.

Certified milk is now available in pasteurized form in many of the 1,000 or more communities where this honor milk supply is available.

The campaign in behalf of certified milk is under the general direction of James A. Tobey, Dr.P.H., chairman of the committee on public relations of the association. Literature on certified milk can be obtained from Dr. Tobey at 350 Madison Avenue, New York, N. Y.

EDITORIAL SECTION

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POLIOMYELITIS

THE outstanding epidemic in 1934 was an outbreak of poliomyelitis in and around Los Angeles, Calif., of which we gave a full account in our *Journal*.[1] The year 1935 has seen another epidemic, this time in the East, centering in North Carolina and Virginia. In our present issue we give descriptions of this.

During the past year two vaccines against poliomyelitis have been put forward and a number of articles concerning them have been published by the experimenters. Although the Editor has had sources of information which have kept him in fairly close touch with the use of these vaccines, comment has been withheld for reasons which seemed sufficient.

At our Annual Meeting in Milwaukee in October, 1935, a number of papers were presented, discussing the manufacture and use of these vaccines. None of these papers were published, since the Southern Branch of our Association, which met in St. Louis in November, had an extensive symposium on the subject, covering more ground than was covered at Milwaukee, and it was considered best to wait for the latest information available. We are now giving, in addition to the description of the 1935 epidemic, discussions of the two vaccines referred to and one paper read at Milwaukee. All of these papers deserve careful attention, and an editorial notice of them would not seem necessary except to bring out certain points which were not stressed at the meetings.

The first trials of the two vaccines were made without what most of us would consider proper controls. We are publishing a paper[2] given at St. Louis in which the use of a vaccine was carried out under the most careful conditions possible. It is evident that a sufficient number of vaccinations have not been done, nor have there been enough controls to form a definite opinion of either vaccine. The estimates given by Gilliam and Onstott[2] are based on an attack rate of 60 per 100,000 in children under 8 years of age. Supposing that the

vaccine was 100 per cent effective, 10,000 children should have been vaccinated, and 10,000 used as controls in order to reach a fair estimate of its effect. If the vaccine were only 80 per cent effective, it would have been necessary to use 40,000 children, and if older persons were included, it would have been necessary to increase the size of the group tremendously. These estimates are "safely conservative." Others made by competent people have run much higher. It is evident therefore that so far no effectual tests of these vaccines have been made. The number of cases, as well as the number of deaths which have occurred following the use of vaccine, and which are believed by many to have been due to one of the vaccines, are also given. In this connection, Park and Brodie,[3] whose vaccine has been fairly extensively used, particularly in Kern County, Calif., say in their conclusions that at least 50,000 more children must be observed under field conditions in order to reach a positive evaluation of their vaccine, and even this estimate is below some which have been made.

There are two points on which emphasis must be laid, one of which was not discussed at either of the meetings. Dr. Kolmer, in summarizing the cases of poliomyelitis which have followed the use of his vaccine, which he holds were not due to the vaccine, but to the fact that the children were in the stage of incubation when the vaccine was given, has mentioned that in a number of these cases the vaccine was given on one side of the body while the paralysis occurred on the other. In the opinion of competent pathologists, this means nothing, since the paralysis is due to the injury done to the pyramidal cells of the anterior horns of the spinal cord. In virus diseases especially, the effects are apt to appear at a part of the body distant from the point of inoculation.

Dr. Kolmer also repeatedly lays stress on the fact that he used "remote monkey passage virus." While he denies having made a positive statement that passage through the monkey increased the virulence of the virus for monkeys, but decreased it for human beings, he admits that he has put forward such a theory. This has been very thoroughly answered by Flexner,[4] who discusses in the same paper the striking instability of the virus of poliomyelitis.

We call attention to the paper by Dr. Thomas M. Rivers, in which he discusses at some length the virus diseases in general, with particular application of the known facts to poliomyelitis, and from these known facts, deduces his estimate of the value of the two vaccines in use and the dangers of one. Since these papers were written, at least two cases of poliomyelitis have followed the use of the vaccine which Dr. Rivers considered safe but valueless.

In April, 1935, the Director of Health of San Francisco City and County appointed an Advisory Committee to study poliomyelitis and the vaccines, in view of the presence of the disease in California, and the possibility of its reaching San Francisco. The report recommended that the Director of Public Health take no active stand favoring the use of vaccine until its value had been more fully demonstrated, and advised further that the experimental administration be restricted to properly qualified research institutions. The committee also expressed its doubt of the harmlessness of preparations containing living virus. We cannot but think that events since that time have proved the wisdom of the recommendations. On December 27, 1935, the Director issued an Executive Order calling attention to the soundness of the recommendations and prohibiting the use of "such vaccines or other similar immunizing agents" in the City and County of San Francisco.

The immediate cause of this order was a special article by Leake[5] giving 12

cases of poliomyelitis which followed the use of vaccines, with 6 deaths. This article lays stress on a point which is mentioned particularly by Rivers; namely, that the appearance of neutralizing antibodies in the blood after the injection of the virus of poliomyelitis is not positive evidence of an immunity to the natural disease.

We believe that the symposium contained in this issue is the most complete discussion of poliomyelitis as it exists in the United States which has been published. There are many other points to which attention might be called, but we ask our readers to study the articles instead of depending on an analysis, even if it were more extensive and perfect than is here given.

We believe thoroughly in experimental work, and nothing said here should be interpreted as a warning against the study of vaccines for the prevention of poliomyelitis. We all hope sincerely that these and other studies may lead to the discovery of a vaccine against this dreaded disease, but we deprecate the style of advertisement which has been given to these vaccines, particularly in the lay press. Dr. John F. Landon has called attention to the damage being done and asked that some authoritative body, such as the New York Academy of Medicine, sponsor a statement prepared for the public as to the status of vaccines against the disease. We commend this idea to the attention of health officers and medical men generally, and again urge our readers to study carefully the material on the subject given in this issue.

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NOTE: The Park and Brodie vaccine has been withdrawn from use on human beings at the request of the directors of the Warm Springs Foundation in Georgia. It is understood that the Foundation has been supplying funds for research in the development of the vaccine.

A BETTER DRUG ACT OR ONLY THE OLD ONE?

S-5 IN THE MAKING

MEDICAL and health and consumer interests hailed the original Tugwell-Copeland Bill in 1933 as expressing a courageous stand of the Roosevelt Administration against the most widespread and lucrative abuses of present-day free commerce in drugs among the people of the United States.

Today after the persistent and successful attacks upon its purpose, integrity of expression, and verbal form, S-5 is as nearly futile and innocuous as the most resourceful drug manufacturer, advertiser, and salesman could desire.

Either the Bill as passed by the Senate at the last session, and now in the hands of the House Committee on Interstate and Foreign Commerce, should be altered to provide some tangible improvement in the drug and cosmetic trade for the safeguarding of the average consumer's health, or it ought to be voted down as unworthy.

Before agreeing to the latter confession of failure, of abject capitulation to the commercial promoters and advertisers who see in medicaments only objects of exploitation for cash profits, we believe five separate and distinct changes in the present text of the bill should be urged upon the appropriate Congressmen by the state and local health officers, and by representatives of all nonofficial health agencies throughout the nation.

The five indispensable changes are the following:

1. Omit the phrase on page 2, lines 10 and 21, "and not for the regulation of the legalized practice of the healing art." Chapter II, Section 201, b and c. This sly little phrase would permit a multitude of abuses by "shyster" practitioners who could carry on an extensive business in the sale of adulterated and misbranded drugs and devices under the guise of professional practice.

2. Delete the sentence beginning on page 13, line 21, authorizing variations from Pharmacopoeial standards, which makes the new bill in this respect practically identical with the present act, and replace it by much more stringent requirements.

3. Section 601 (False Advertisement), page 21, now under attack and likely to be weakened, or its enforcement assigned to the Federal Trade Commission, should be preserved or made more effective, and its enforcement definitely established under the Food and Drug Administration of the Department of Agriculture.

4. Under Section 711a, page 36, the proviso, lines 10–18, should be stricken out as it weakens the seizure provision of the present law and would unduly hamper the government in proper seizure on evidence of misbranding. In matters of this kind where the public health is at stake or where flagrant deception of consumers exists, no restriction should be placed on the exercise of seizure to remove offending goods from the market before they reach consumers and do their damage.

5. Under the same Section 711a, on page 36, the provision, lines 18–20, "That said single seizure action shall on motion, be removed for trial to the jurisdiction of the claimant's residence," should be deleted so that, as under the present law, the action will be tried where the seizure is made—that is, in the consuming rather than the manufacturing jurisdiction. For the same reason a similar change should be made in paragraph (b) of this same section by striking out the words on page 37, lines 6 and 7, "or for the district of the claimant's residence."

There is some merit in the Bill as it now reads but hardly enough to justify any support by health, or medical, or consumer interests.

With the changes suggested it could become a powerful weapon of offense or defense for the welfare of the public.

AMERICAN CHILD HEALTH ASSOCIATION COPYRIGHTS TO THE AMERICAN PUBLIC HEALTH ASSOCIATION

IN the advertising pages of this *Journal* a list of publications appears which were prepared and formerly distributed under the aegis of the American Child Health Association.

The Executive Board of the American Public Health Association has acknowledged this gift with appreciation and has approved the transfer of 15 copyrights in the name of the American Child Health Association. The publications these

documents cover are now the property of this organization. These, together with certain instruments of measurement developed by experts of the American Child Health Association and additional books and pamphlets, the copyrights of which are still owned by the original recorder, are now available through the Book Service.

By keeping alive and current these valuable aspects of the work of the now dissolved American Child Health Association, we shall hope to continue the service so competently rendered to the public health profession by that agency in the past.

ANNA M. PABST

RESEARCH has claimed another victim. The Public Health Service has recorded on its special honor roll Anna M. Pabst, who died of meningitis on Christmas night in Washington, D. C. Miss Pabst was working on meningitis serum. While injecting an animal on December 17 at the National Institute of Health, it moved and some of the culture was squirted into her eye. In spite of prompt cleansing she was stricken on December 21 and died on December 25. She was very highly regarded at the National Institute of Health.

Those who use biological products, which have done so much to take away the dread of many diseases, do not realize the risks that laboratory workers run in their study. Science has an entirely too long roll of honor brought about by accidental infection in studying disease. This *Journal* and the Association which it represents unite with others everywhere to honor this latest martyr to science.

COMING WITH THE MARCH JOURNAL!

The 1935–1936 American Public Health Association Year Book.

More than 50 reports of scientific committees presented at the Sixty-fourth Annual Meeting in Milwaukee are included which will not be published elsewhere. The Year Book is a handy reference volume which many health workers have come to regard as part of their permanent desk equipment.

Watch for your copy!

THE OPEN FORUM

REGINALD M. ATWATER, M.D.
Executive Secretary, American Public Health Association

DO YOU USE THE EMPLOYMENT SERVICE?

ATTENTION is called to the fact that the Association has for years maintained an exchange between employers and employees in the field of public health.

In 1936 it is planned to expand and improve this service with special reference to the demands which may be made upon the Association as a result of the application of the Federal Social Security Act. A systematic recording of all persons trained and experienced in technical public health activities is being compiled for the benefit of agencies of the United States Government and of the state departments of health.

Persons desiring to register in this connection should write to the office of the Executive Secretary for the appropriate blanks. No charge is made for the service of the Association or for publishing announcements of applicants who are members or Fellows.

The attention of prospective employers is directed to the fact that announcement of examinations through civil service channels or otherwise will be carried in the *Journal* without charge and that they are welcome to consult the Association on matters of employment. It is the policy of the American Public Health Association to assist employers and employees, properly qualified, to get together. It is not the policy of the Association to recommend employees for particular positions.

END OF YEAR PUBLICITY

I HAVE been interested to see this year how many good health officers are taking advantage of the timely interest of the public in the records for 1935 by having a summary of health department results ready for publication promptly after the close of the year. Some of the department are evidently closing their books a bit before December 31, in order to take advantage of the psychology that comes with new year time.

Among the releases which were ready this year, I was struck by that of Baltimore's City Health Department in which the outstanding problems of the city are thoughtfully presented by Dr. Williams and Dr. Fales. Syphilis is presented as an outstanding enemy of health, and it interested me to follow through to see how much newspaper coverage a statement of this sort received.

This statement has appeared in conservative papers throughout the city, and "syphilis" has been repeated more frequently than is customary because of the emphatic way in which the facts are presented. The matter is covered editorially very well and, in addition, there is a comment by one of the regular columnists which rather effectively brings the attention of the public to the health department.

Most outstanding, however, is a Christmas Eve editorial in one of the papers which, under the title of "Glad

Tidings," recommends attention to the report because of its good news on the control of diphtheria, and goes on to say that, if only the shame and secrecy with which syphilis is surrounded could be overcome, it would be possible to rid society of this menace as well in a generation.

We have waited a long while for the papers to turn about face on their attitude on syphilis publicity, but this time seems to have arrived in Baltimore.

THE CENTURY MARK IN LIFE MEMBERSHIPS

IT is a pleasure to record that the number of Life Members in the Association has reached and passed the hundred mark with the beginning of 1936.

One hundred and five of our members who believe in the Association and who know their own minds on their professional careers have chosen this means of relieving themselves of all future worry about dues. And they have in the aggregate saved money, too. Have you considered this opportunity at the beginning of 1936? "It's smart to be thrifty."

DO WE HAVE CLEAR THINKING STUDENTS TODAY?

DR. Thomas Parran, Jr., in his Biggs Memorial Lecture, given on May 2, 1935, quoted from the graduation thesis 54 years ago of Dr. Hermann M. Biggs, who was a candidate for the bachelor's degree in Cornell University. The subject of the thesis was "Sanitary Regulations and the Duty of the State in Regard to Public Hygiene."

These abstracts from Dr. Biggs's thesis are so revealing and shed so much light on the insight which Biggs had half a century ago that they are reproduced here. I believe they should be made a matter of record more widely available.

> This is a period in our national history in which sanitary science is receiving a large and constantly increasing share of public and professional attention. The last half century . . . has been marked by great advances made in this direction; advances which we may reasonably believe are but first indications of the greater developments in the future.
>
> The enjoyment of health, immunity from suffering, and long life, are the greatest temporal blessings that man can desire. . . . There are certain natural and sanitary laws that regulate the functions of life, . . . insure a more uninterrupted enjoyment of health, exemption from many infirmities, and a prolonged existence.
>
> Upon the recognition and careful observation of hygiene laws depend the healthy physical condition, and so the prosperity not only of individuals and communities but also of whole states and nations. . . .
>
> . . . There are other considerations far higher than the financial one which render governmental action in regard to the public health imperative. . . . Not only is the physical condition of a public dependent upon their sanitary surroundings but their moral and intellectual condition is also largely determined by those same surroundings.

Through several sessions of the Legislature from 1919 until his death, Biggs fought for an integrated system of preventive and curative medical service in the state. He proposed:

> 1. To provide for the residents of rural districts, for industrial workers, and all others in need of such service, scientific, medical, and surgical treatment, hospital and dispensary facilities, and nursing care at a cost within their means, or, if necessary, free.
>
> 2. To assist the local medical practitioner by providing facilities for accurate diagnosis . . . both hospital and out-patient; consultation and advice as to treatment by medical and surgical experts; clinical, pathological and chemical laboratory service and X-ray facilities, at a moderate cost or free when necessary.
>
> 3. . . . Facilities for an annual medical examination . . .
>
> 4. . . . Adequate school medical inspection and school nursing service.
>
> 5. . . . Better . . . administration of public health activities . . .

6. A public health nursing service adapted to and adequate for the community served.
7. . . . Dissemination of information in regard to public health . . .
8. Adequate compensation for medical and surgical service rendered in hospitals and clinics . . .
9. Laboratories, diagnosticians, consultants, and hospital facilities in the smaller cities and rural districts.
10. Medical libraries and health educational material.
11. Hospital and other necessary resources for dealing promptly with epidemics.
12. . . . Prompt and accurate diagnosis and surgical treatment for sick and indigent (industrial) workers and members of their families.
13. Coördination of public health activities within the districts.

WILL YOU BE IN ENGLAND THIS SUMMER?

THE Royal Sanitary Institute will meet again in Southport, England, July 6 to 11, 1936. At its meeting on December 19, the Executive Board authorized the Executive Secretary to appoint members of the Association who might be in England during the days of this health congress to represent the Association. The Executive Secretary will be very happy to have word from any members or Fellows who plan to be in England at that time.

"THE CONTROL OF COMMUNICABLE DISEASES"

THIS new publication which was announced at the Milwaukee meeting has already gone through a large edition and is being reprinted. Orders have been received from all sorts of official and private agencies. One state health department is considering an edition of 2,000 copies with its own imprint, as the document has been made official. It carries also the approval of the Surgeon-General of the U. S. Public Health Service. Have you your copy? Is your staff completely supplied? It is doubtful if there is any other publication at the price of this edition which answers so many questions in so authoritative a way.

FOR YOUR LITERATURE TABLE

A BOOKLET entitled, "Your Friend, the Health Officer," written by Dr. Wilson G. Smillie of Harvard, has recently come to my attention, a publication of the Life Conservation Service of the John Hancock Life Insurance Company, of Boston. This is a very readable story about the health officer's function which might be of utility in many places where the public service rendered by the health officer is still regarded as a mysterious occupation, easily to be dispensed with.

A MANUAL FOR TEACHERS

AN unusually attractive document has come to my desk from Madera County, Calif., of which Dr. Lee Alexander Stone is the full-time Health Officer. This publication, which is called "Principles of Good Public Health Practice," is a manual for use by the principals and teachers of the schools in Madera County. It is a mimeographed publication of about 100 pages, made unusually attractive through various typographical means. It answers a thousand questions of the school teacher on health subjects. Although claiming no originality in the publication, there is reflected something of a different quality from many publications of this sort and, if a county of 18,000 persons with limited financial resources can produce as creditable a manual as this, it ought to be equalled by a good many larger units.

TOXOID ITEM

THE Dionne Quintuplets have each received three doses of diphtheria toxoid from Dr. Dafoe and Dr. A. L. McKay of the Ontario Department of Health. This fact should encourage

many a parent to do likewise if health departments will utilize this news.

A CORRECTION

THE chart illustrating the usual course of measles carried in this column last May (page 641; also page 1354) which was credited to the Michigan State Department of Health should have been credited to the originator, Dr. Charles F. McKhann of Boston.

ARE YOU "CAUGHT UP"?

DO you ever get caught up on public health education? If you do, this story relayed by a friend in West Virginia will certainly have an appeal. He tells of a neighbor of his, a Portuguese farmer, to whom he offered a book on crop rotation and soil rejuvenation. The farmer refused it, saying: "I don't farm as good as I know now." How many people do not live "as good as they know" now?

PUBLIC HEALTH EDUCATION*

The Quints as Health Educators—Is it not likely that great numbers of people have been reading about the better care of babies who would refuse to look at a health department article in the newspaper? And all because of the gold fish life of 5 little girls!

Today's headlines in one evening paper:

Quints Display Curiosity, Not Fear, As Doctors Administer Toxoid.

The Quints Make a Game of Diphtheria Injections; Marie Cries, but All Others Gurgle with Glee.

Here is part of the report of the third injection:

The scientific care which has brought the Dionne quintuplets safely through 19 perilous months has now also provided them with the best known protection against diphtheria.

Despite the nursery precautions against infection and despite the almost perfect health of the babies today, Dr. A. R. Dafoe decided to take no chances with diphtheria. He felt that without special toxoid protection the risk of that deadliest scourge of childhood was too great.

So the 5 little sisters have now successfully completed a course of 3 injections each of anti-diphtheria toxoid. The first treatment was in November and the last just before Christmas.

The N.E.A. Service report then quotes Dr. Dafoe and Dr. J. A. Faulkner, Provincial Minister of Health, who say what health officers have been telling their publics for a number of years. And these quotations have been published widely all over the United States and Canada.

One of Six—At St. Louis, during the meeting of the American Association for the Advancement of Science, a special interview was given by the Association president, Dr. Karl T. Compton, who is president of the Massachusetts Institute of Technology.

Dr. Compton offered a 6-point program for the broad welfare of the nation, one point being as follows:

Recognize prevention and conquest of physical and mental diseases as far more economical and humanitarian than merely the care and treatment of those already afflicted.

Educate Them All—C. E. Davis discusses "The Rôle of the Hospital in the Education of Doctors, Nurses, and Others Engaged in the Care of the Sick." The "others" include

The housekeeping personnel, made up of the janitors, window washers, maids, sewing women, laundry workers,

all of whom play an important part in the hospital environment. The author is more insistent upon learning ability being limited to the young than the studies of E. F. Thorndyke would seem to support.

In *Hospitals*, 18 E. Division St., Chicago, Ill. Jan., 1936.

The Hospital in Health Education—Says Ira V. Hiscock, "Mutual Interests of Hospitals and Public Health Organization":

The hospital and the clinic have a responsibility for the education of both patients and personnel. The opportunities of health education in the clinic have been ably discussed by Galdston, who urges that the clinic, instead of being only a place to which the lame and the halt go for cure, might also serve as a center where persons

* Please address questions, samples of printed matter, criticism of anything which appears herein, etc., to Evart G. Routzahn, 130 East 22d St., New York, N. Y.

might be instructed on how to keep well. Our present-day knowledge of the nature of disease indicates that to cure a patient we must also teach him. Preventive medicine, even more than curative, depends for effectiveness upon education. Dr. Lawrason Brown, speaking on the rôle of education in the treatment of tuberculosis, said that he looked upon the sanatorium as a sort of college where men and women were reëducated in a newer method of living. If the tuberculosis patient needs to be reëducated to a newer method of life, many other types of patients, both in the clinics and in the hospitals may likewise be served.

The clinic offers an excellent opportunity for general health education through visual methods and literature, and for special instruction regarding immunization against disease. Through physicians and nurses in maternity and children's hospitals, a unique opportunity for instruction in maternity and child care is provided.

The clinical-pathological conferences in some hospitals, besides special lecture series, are valuable from a public health viewpoint as well as for clinical purposes. High standards of medical and surgical practice favorably influence the public health experience of a community. Stimulus may be given to house physicians to take epidemiological as well as purely clinical histories, and to consider the social backgrounds of their patients in relation to other problems. Such topics as the indications for the use of anti-pneumococci serum and the importance of filling out case records properly are timely. The Connecticut Department of Health makes a valuable contribution to the education of pupil nurses through a course of public health lectures given upon request at nurses' training schools.

In *Hospitals*, American Hospital Association, 18 E. Division St., Chicago, Ill. Jan., 1936.

By Pennies and Half-pennies—The Boston Health Department and other agencies are interested in a new exhibit project described in *Bulletin*, Boston Council of Social Agencies, 43 Tremont St., Boston, Mass. Dec., 1935.

The Health Education Committee of the Boston Health League is much concerned with the question, for many people, of obtaining sufficient food in the face of rising food costs and limited incomes. At a meeting in the early fall, it was decided that a series of food exhibits demonstrating elementary principles of nutrition, if placed in the Health Units, would be seen by large numbers of people and would be a practical method of teaching food values and how to spend food money to help insure good health. The present plan contemplates one new exhibit each month, moving the preceding one to another Health Unit.

Enthusiastic coöperation in working out the plans has been given the committee by the City Health Department, the Department of Public Welfare and the nutrition workers of the voluntary agencies.

The first exhibit depicts the importance of including in the day's meals the whole-grain bread and cereal. Gay yellow streamers lead from loaves of bread, and red bowls containing cereals, to charts that show plainly how the different kinds of bread and cereals compare in their content of iron, while shining new pennies or half-pennies indicate the cost of a single serving. The observer sees that a certain cereal is a little more expensive than another, but also that it contains more iron and should, therefore, be his choice.

The Editorial of the Month—Under "Medicine's Academy" the *New York Times* (Jan. 3, 1936) said:

The arts, letters, and sciences have all their "academies," but nearest to the public is the academy concerned with the health of the people. The president of the New York Academy of Medicine, Dr. Eugene H. Pool, emphasized this relationship in his address last night at the annual meeting, for while the academy seeks directly to keep the profession informed as to advances in medical science . . . its ultimate interest is in the health welfare of all the people of the community—individually and collectively.

To that end it maintains an information bureau for the receipt of inquiries from any quarter. Thousands of these are made in the course of the year and answers given, carrying to home or office the latest and best information that the science has to offer. But it does far more than answer individual and organizational inquiries. It furnishes "releases" to the press on important medical subjects and arranges for radio addresses over the major systems—especially addresses by fellows of the academy which reach practically every part of the country. It also assists public health

organizations in their educational activities. In addition to these, lectures for the lay public are given in the academy's lecture hall.

Every month we would like to reproduce at least a part of a newspaper editorial. Please submit your nominations.

New York City Is Broadcasting—These paragraphs are from the 1934 annual report of the New York Tuberculosis and Health Assn., 386 4th Ave., New York City:

The radio service, which is conducted in coöperation with the Medical Information Bureau of the New York Academy of Medicine and the local county medical societies, reaches vast numbers and makes possible a well rounded health education program throughout the year. So established are the high standards of this coördinated service on the air that the stations look to it for information, not only in connection with the subjects that form the Association's main concern, but also in regard to many other matters pertaining to health.

Last year a total number of 381 radio broadcasts reached audiences listening in on 13 different stations in New York City alone. These stations are exclusive of the nation-wide networks where our programs have been offered by one of the broadcasting companies to its complete network of 100 stations throughout the country. Certain weekly programs have included as many as 150 stations, and during special campaigns, this number increases.

The majority of these broadcasts are given by physicians, fellows of the New York Academy of Medicine, and members of the County Medical Socities, as well as by members of the dental societies and by professional workers representing social and health agencies.

The broadcasts given during the Early Diagnosis Campaign covered various phases of tuberculosis prevention and work in child health. During the Christmas Seal Campaign, talks and special features were planned for which we enlisted the services of outstanding public health authorities and well known radio personalities. Other related health subjects were covered as season and occasion warranted.

Radio in Canada — "Common Colds," by Gilliam David, is a radio play written for the Health League of Canada. After 10 years of broadcasting health talks by the Canadian Social Hygiene Council a committee was called in the summer of 1935 to study radio education.

The suggestion was made that instead of the regular talk of 12 to 15 minutes, which had previously been used, an attempt be made to dramatize these talks and produce interesting plays and dialogue which would contain much helpful information and at the same time provide a good radio entertainment.

Therefore it was decided that an attempt to produce such plays be made. The committee now announces that a series of 6 such dramas and plays have been written and transcribed electrically for use by radio stations. It is hoped that the series will consist of 24 plays and dramas dealing with such subjects as Common Cold, High Blood Pressure, Anemia, Diphtheria, Preventive Medicine, The Work of the Health Officer, etc.

The manuscript of the plays has been written by Miss Gilliam David. A suitable cast has been chosen and rehearsals have been carried out faithfully until suitable discs have been produced.

Stations located in many parts of the Dominion have agreed to make use of the transcriptions.

In *Health*, 105 Bond St., Toronto, Ottawa. Dec., 1935. *15 cents.*

How to Get Good Housing—This is a sub-heading in "Health and Housing," by Dr. R. St. J. Macdonald in *National Health Review*, Ottawa. Oct., 1935. No subscription price.

The three elements necessary "in order of importance," as outlined by Dr. Macdonald, are education of the public in house hygiene, legislation, and law enforcement.

The people must be told what bad housing means, its evil effects upon their own and their children's health, and how the menace may be averted. They should also have explained to them the essential requirements of a healthy home, so that they may be able to secure one when renting or building.

This education must be extended to all the people, not alone to the housewives who generally do the renting, but also to legislators, architects, builders, land-owners, surveyors, engineers, landscape artists, etc. In addition, janitors, guardians or custodians of dwelling-houses should be given courses in their management.

While, primarily, builders erect houses to make money out of them, yet it must be realized that they may sometimes put up unhealthy dwellings because of ignorance of housing evils, or because they know how frequently housing laws are not enforced.

The people must be educated in personal hygiene. They must be shown the manner in which communicable diseases spread. They must be told that room overcrowding is dangerous; that if a well person sleeps with a coughing case of tuberculosis, there is great danger of the former's contracting the dread disease. It must be explained that a tuberculous person occupying a separate, well lighted and well ventilated room is not dangerous to others if proper precautions be taken. It must be stressed that children cannot grow into healthy, useful citizens if they are brought up in dark rooms; that, like cellar plants, they will be pale and frail weaklings.

Then follow paragraphs about the part of teachers, visiting nurses, general practitioners, the press, public health workers, and social workers.

Ammunition for the job of education is supplied in "America Becomes Housing Conscious," by J. E. Davies, in *Journal of N.E.A.*, 1201 16th St., N.W., Washington, D. C. Dec., 1935. *25 cents.*

Some of the sub-headings will indicate the interesting nature of the material:

Is this a high standard of living? . . . Where children and flowers cannot thrive. . . . Slums—the most costly housing. . . . Cities that don't just grow. . . . Houses at the store. . . . Teaching housing in the schools.

Bulletins or House Organs—Once a year it seems worth while to review the high lights of the contents of the numerous periodicals issued by departments and associations. Unfortunately we are limited to those publications which are received by the editor.

The tuberculosis issue of *The Commonhealth* carries 19 articles. Massachusetts Dept. of Health, Boston. Jan.-Mar., 1935.

The *Red Cross Courier*, Aug., 1935, has a page on "The War Against Pellagra"—from 1735 to Red Cross activities in 1935.

"With the Wisconsin Editors," a section of *State Board of Health Bulletin*, Madison, Wis., reproduces editorials on public health topics.

"A Sanmag Scrutiny," by Elizabeth Cole, and "The Hardest Year" (the first), by J. E. Windram. Not to be missed by those concerned with publications in sanatoria. *Journal of the Outdoor Life*, 50 W. 50th St., New York, N. Y. Dec., 1935. *15 cents.*

More notes next month.

Let's Talk It Over—We have made but a hopeful beginning in the "talking it over" approach to interest and understanding as to public health. "Good References on Discussion Meetings, Open Forums, Panels, and Conferences," by M. R. McCabe. *Bibliography No. 30* issued by Office of Education, Washington, D. C. A 9 page pamphlet listing articles, pamphlets, and books, some of which are sure to be available or easy to secure. *Free.*

Public Health at State Fairs—State departments becoming interested in making use of space at state fairs may wish to consult the state departments of Ohio, Illinois, and New York, which had extensive displays last summer or fall.

State Health Education Workers—Again we have the annual directory of State and Insular Health Authorities, in *Public Health Reports*, Washington, D. C. Dec. 20, 1935.

The following health education titles are listed:

Connecticut: Bureau of public-health instruction
Illinois: Division of public-health instruction
Indiana: Bureau of health education
Iowa: Division of child health and health education
Kansas: Division of public health education
Kentucky: Bureau of public health education
Maryland: Committee on public health education
Michigan: Bureau of education (director, assistant director, lecturer)
New Jersey: Bureau of public-health education
New York: Division of public-health education
Ohio: Bureau of publicity
Pennsylvania: Division of public health education
Texas: Bureau of public health education
West Virginia: Bureau of public health education
Wisconsin: Bureau of education

As may be noted four states are "public-health," while six are "public health."

Only one state lists more than a single person in the bureau or division.

Hygeia, January, 1936—Published at 535 N. Dearborn St., Chicago, Ill.

Does illness begin at forty? . . . Curious stories about health. . . . The 1936 models in diet. . . . Pocket calorie index (illustrated chart). . . . The riddle of the blood relation (a medical mystery). . . . Which is the weaker sex? . . . Health gadgets for the gullible. . . . Toys and games that teach and train. . . . P.A.D.—Prevent asphyxial death. . . . Glands—their influence on body build and behavior. . . . Edward Jenner. . . . Rickets. . . . Mouth reconstruction. . . . What is a mastoid? . . . Venereal disease—the modern plague. . . . Puberty in fact and fancy. . . . Budgeting the reserve strength of the heart. . . . New traveler's clothing. . . . The lens maker (a play). . . . New health books. . . . Questions and answers.

In "School and Health" section:

When a child is mentally healthy? . . . Health teaching in January. . . . A classroom demonstration in nutrition. . . . A health play brings interesting and effective results. . . . New health books for teachers and pupils.

DATES AHEAD

February 9—Incorporation of American Social Hygiene Assn. in 1914. An anniversary significant in the social hygiene movement.

February 10—The first hospital in the modern sense of the word, the Pennsylvania Hospital, opened its doors to patients in 1752.

February 22—Washington's Birthday. An opportunity for contrasting health conditions and the care of the sick of Washington's time with what prevail today.

March—The first visiting nurse started her rounds to the sick poor in March, 1877, although an untrained woman visited disabled sailors and soldiers in Charleston, S. C., in 1813.

Additional information about the above and future dates will be found in "News Almanac for Social Work" for 1936. Community Chests and Councils, Inc., 155 E. 44th St., New York, N. Y. *50 cents.*

A first use for such dates may be in staff meetings and in staff house organs, with possibilities for wide utilization in the newspapers, by radio, in meetings, etc.

FOR REFERENCE OR EDUCATION

"Competitive Plagues of Mankind," by D. B. Armstrong, M.D. Reprint. Metropolitan Life Insurance Co., 1 Madison Ave., New York, N. Y. Heart disease, cancer, pneumonia, accidents, tuberculosis.

"Don't Spare the Soap!" by Shirley Wynne, M.D. Reprint. Free, from Health Cleanliness Service of Procter and Gamble, 80 E. 11th St., New York, N. Y.

"The Economic and Social Aspects of Socialized Medicine," by Iago Galdston, M.D. Reprint. Address the

author, 2 E. 103d St., New York, N. Y.

Four page folders; limited, well written text; plenty of white space; from New York City Department of Health: "For Expectant Mothers," "Gonorrhea," "Syphilis."

"Growth of School Leisure Time," and "School Health Problems Through the Years: Boston Public Schools 1635–1935," by J. P. Sullivan, supervisor of health education, Boston School Department, Boston, Mass. Reprints. Address the author.

"Health Facts," a "scrap book" of selections for use in writing about public health. Grouped under "Health Can Be Measured," "Health Can Be Purchased," "What Tax-supported Health Agencies Do," and "What Voluntary Health Agencies Do." 24 pages. *20 cents.* National Health Council, 50 W. 50th St., New York, N. Y.

The latest addition to the group of aids for those concerned with housing is *Housing Digest,* a mimeographed bulletin issued by Housing Division, Public Works Administration, Washington, D. C. This is "an abstract and index of current thought on housing problems, foreign and domestic." Intended primarily for a busy staff it is likely that copies will be sent upon request from a public health worker.

Most of the publications of the former American Child Health Association will be handled by the American Public Health Association and by the National Education Association, 1201 16th St., Washington, D. C. Those handled by the A.P.H.A. are listed on pages XIV and XV of the advertising section of this issue.

"National Aspects of the Social Security Program as They Pertain to the Children's Bureau," by Katharine F. Lenroot. Reprint. Children's Bureau, Washington, D. C.

The November releases of Health News Service, 22 E. 40th St., New York, N. Y., covered mouth hygiene subjects. Child hygiene was presented in January. This material is supplied free for newspaper use. A new service illustrates the answers to health questions. The style is that of the familiar "Believe It Or Not." Be sure to get samples. May be used in different ways.

"The Pro and Con of Vitamin D Milk," by F. O. Tonney, M.D. Reprint. Address the author: 6737 Greenview Ave., Chicago, Ill.

"Public Health Service Milk Ordinance and Code: 1935," is a fully indexed pamphlet with halftone and linecut illustrations. Superintendent of Documents, Washington, D. C. *15 cents.*

The recent annual meeting of National Society for the Prevention of Blindness, 50 W. 50th St., New York, N. Y., included a session on "The Problem of Fireworks Accidents." Four of the addresses are available in mimeographed form.

"What Is the Early Case?" In *Tuberculosis Abstracts.* Dec., 1935. Free from a tuberculosis association.

GRAPHIC MATERIAL

Hygiene museum interest in different sections of the country was reported to the Governing Council by the Committee on American Museum of Hygiene of which Dr. Victor C. Heiser is chairman. The report will appear in the annual *Year Book* of the A.P.H.A.

"Puppetry Bulletin," for 1935–1936 is obtainable of Paul McPharlin, Birmingham, Mich. Enclose *3 cents* postage. Almost indispensable if you are interested in puppets or marionettes, with its addresses for supplies and equipment, mention of late books and pamphlets, and other current information.

"On Relief" is one of the best examples of American produced Dr. Neurath type of graphic presentation.

Prepared by Graphic Unit of the Research Section, Federal Emergency Relief Administration, Washington, D. C. There are 21 good sized charts, in two colors, with an explanatory statement of 50 to 125 words on the opposite page. Probably copies will be supplied by addressing Washington, or the director of the Graphic Unit, Rudolph Unit, Pictorial Statistics, 160 E. 36th St., New York, N. Y.

MAGAZINE ARTICLES

"Birth-control Debate Renewed." "Question, once furtive, now discussed in public hearings." *Literary Digest*, New York City. Dec. 14, 1935. *10 cents.*

"Colds and Where to Catch Them," by F. S. Bigelow. *Saturday Evening Post*, Philadelphia, Pa. Nov. 30, 1935.

"Give Your Brain a Chance," by Dr. C. W. Sawyer. "Science and common sense have taken much of the mystery from insanity." *Rotarian*, 35 E. Wacker Drive, Chicago, Ill. Jan., 1936. *25 cents.*

"The Robinsons' Dog Has Rabies," by S. J. Crumbine. *National Parent-Teacher Magazine*, 1201 16th St., Washington, D. C. Jan., 1936. *15 cents.* "The Robinsons took a chance in not taking it more seriously when their pet began to act queerly."

"Someone Must Pay," by J. Frampton. "Home Safety" (editorial). *Kiwanis Magazine*, 520 N. Michigan Ave., Chicago, Ill. Dec., 1935. *15 cents.*

"That New Baby," by Dr. W. R. Ramsey. *Farmer's Wife*, St. Paul, Minn. Dec., 1935.

"The Truth About Colds," by J. W. Ephraim. *American Mercury*, 570 Lexington Ave., New York City. Jan., 1936. *50 cents.*

MOTION PICTURES

"Adapting Animation" and "New Wrinkles on Newsreels" are two articles for the amateurs who wish to make fuller use of the technic available. *Movie Makers*. Amateur Cinema League, 105 W. 40th St., New York, N. Y. Jan., 1936. *25 cents.*

"Films for Theatres, Clubs, Schools and Other Organizations." A new descriptive list of movies and film strips offered by Metropolitan Life Insurance Co., 1 Madison Ave., New York, N. Y.

From American Social Hygiene Assn., 50 W. 50th St., New York, N. Y., comes this announcement:

Three-reel talking film, Science and Modern Medicine, prepared by a special committee of the association to accompany the drama, Damaged Lives, may now be had for non-commercial showings separately from the drama. The film deals with the process of human reproduction and with the so-called venereal diseases—syphilis and gonorrhea—and their effects on individual health and family life.

Both 35mm and 16mm are sold or rented.

Ask for free booklet, A Three Point Program in Health Education, Pub. No. 852, which gives scenario and text, and outlines of the Special Series of pamphlets prepared by Dr. William F. Snow, Health for Man and Boy, Women and Their Health and Marriage and Parenthood, which are recommended to supplement this film. These may be secured for *15 cents* per set.

NEW

Hospitals, to succeed *Bulletin*, American Hospital Assn., 18 E. Division St., Chicago, Ill. An extensive professional journal, 11½ by 8½ inches, 136 pages. No subscription price given.

RADIO

The Department of Health, New York City, is now broadcasting according to the following schedule:

Monday, 2:45 p.m., WNYC
Tuesday, 2:15 p.m., WVFW
Wednesday, 10:45 a.m., WARD
Wednesday, 12:00 p.m., WNYC
Wednesday, 4:30 p.m., WBNX
Thursday, 3:30 p.m., WRAD
Friday, 9:45 a.m., WINS

Recent broadcasts by several state and city departments are listed below.

Baltimore City Health Dept. (auspices of Medical and Chirurgical Faculty of Maryland):

Our city's health and the Community Fund. . . . Crippled hearing. . . . Children who eat paint. . . . Some common dangers in the home. . . . The relationship between the City Health Department and the Department of Public Welfare. . . . Tuberculosis is everybody's business. . . . Why little Mary won't eat. . . . Preventive dentistry. . . . Tularemia. . . . Santa and good health. . . . Dr. Kelly speaks on radium and X-ray. . . . Common sense at Christmas time. . . . Taking Lord Baltimore's pulse (health survey).

Connecticut State Department of Health (by different staff members):

Keep your garage doors open. . . . Mental hygiene makes progress in Connecticut. . . . The septic tank. . . . Making ice cream a safe food. . . . Guarding the health of future generations. . . . The public health nurse's place in the community health program. . . . Emotions under control. . . . The state of our health.

Illinois State Dept. of Public Health (given by Dr. C. W. Chamberlain, Division of Communicable Diseases):

Over-weight and disease resistance. . . . Wars and rumors of wars (wounds and disease). . . . A soldier of fortune (Louis J. Cantor). . . . Newer knowledge of disease resistance and physical differences in mankind. . . . They call them accidents (in the home). . . . The new doctor diathermy. . . . Highway hysteria. . . . Privileges and perversities of the poor pedestrian. . . . A health officer looks at Ethiopia. . . . Can the newer generation face the facts? . . . Is this the most common disease in America? (sinus trouble). . . . Physical activity and disease resistance. . . . The big bad wolf—superstition. . . . You don't believe in doctors? . . . Babies, burns, blisters, and brews. . . . Lending nature a helping hand. . . . Hear ye! Hear ye! (hearing). . . . More martyrs in medicine. . . . Newer approach to speech defects.

Ohio State Department of Health:

Tuberculosis control and the school child. . . . Maternal and child hygiene program under the Social Security Act. . . . Carbon-monoxide poisoning. . . . The school nurse. . . . Just teeth. . . . What have you on deposit in your heart bank? . . . Epidemic meningitis. . . . Diphtheria.

CHILDREN AND SCHOOLS

"A Project in Rural School Health Education," by Ruth E. Grout. Reprint from *Milbank Memorial Fund Quarterly Bulletin.* Includes "Initiating the Study," "Building the Program," "Unit Teaching," "Relationships With Community Health Programs," and "Home-School Relationships."

"The School Doctor States His Case (the school, the home, and the community share responsibility for the protection of child health)," by Harold H. Mitchell, M.D. "Turning the Light on School Lighting," by Hugh G. Rowell, M.D. *National Parent-Teacher Magazine,* 1201 16th St., N. W., Washington, D. C. Dec., 1935. *15 cents.*

Health Bulletin for Teachers, School Health Bureau, Metropolitan Life Insurance Co., New York, N. Y. The 1935–1936 issues will be devoted to "the Conquest of Disease," the primary aim being

To tell in simple and dramatic form the story of the conquest of certain typical plagues of mankind. The affections have been selected to illustrate various types of disease (communicable, constitutional, dietary, mental) and to illustrate the biological, geographical, and socio-economic factors contributing to their control. Practical applications and limitations of present knowledge will be appropriately emphasized.

BOOKS AND REPORTS

The Pneumonokonioses (Silicosis): Literature and Laws of 1934—*By G. G. Davis, E. M. Salmonsen, and J. L. Earlywine. Chicago: Chicago Medical Press,* 1935. 490 pp. Price, $10.00.

The present compilation of references on one of the most important occupational diseases—silicosis—is the second volume of a series. The first volume contained a bibliography of nearly 3,000 references dating from 1556 to 1933, inclusive. The present volume, including all the publications on the subject issued during the year 1934, has the added advantage of presenting a brief abstract of each article. The book is made up of two parts, the Abstracts and the Laws; the Abstracts are followed by an Authors' Index and a Subject Index. In addition, certain references omitted in Book I are included in this new edition.

In the reviewer's opinion, many of the newspaper accounts included in the book could very well have been left out, thereby giving a more scientific aspect to the volume. Personally, the reviewer would rather that the references were arranged according to subject matter instead of the alphabetical treatment presented. Thus, a reader who is interested only in the pathology of asbestos dust inhalation would find all the articles on this subject listed in one place.

These suggestions are offered for consideration should additional volumes on this subject be in progress, and are not meant to detract in any manner from the value of this book to students of dust inhalation. Indeed, the authors are to be congratulated for their courage and perseverance in undertaking the difficult task of compiling the two books issued to date. Both volumes should prove to be extremely useful to students of this occupational disease.

R. R. SAYERS

Industrial Medicine—*By W. Irving Clark and Philip Drinker. New York: National Medical Book Co.,* 1935. 262 pp. Price, $3.00.

This book which is one of a series of monographs, proposes to clarify the knowledge of the general practitioner in regard to what industrial medicine is and to inform him of standard practice in this field.

The first part of the book is disappointing in that it does not adequately cover its field. It is not broad enough for a text and is too broad for concise expression. We cannot agree with the authors for example, that the limited discussion of fractures, injuries, and sprains has a place in a book of this type, for any surgeon knows more about these conditions than can be learned here. Nor do we believe that physicians in industry will care to share the responsibility of caring for the general practitioner's private patients by doing laboratory and other technical work for him. This can easily constitute interference with the patient's own physician and divided responsibility for any patient is undesirable. The chapters on organization are not comprehensive enough to be of universal value.

That portion of the book which deals with the occupational diseases more than compensates for any faults that may exist elsewhere. The chapters on pneumoconiosis are excellently and clearly written, and describe in an understandable manner an inherent disease of industry about which little

is known by the profession in general.

The concise presentations of other occupational diseases and methods for their prevention make the book valuable for reference. The extensive bibliography is especially valuable in this connection. The book is well indexed but the illustrations are of little consequence except those in the chapters on pneumoconiosis.

We believe it a worth while addition to any medical library.

D. B. LOWE and W. C. ARTHUR

Sanitation and Health Standards for Summer Camps—*By E. B. Buchanan, M.A.; R. J. Ochsner, M.D. Published by the Anti-Tuberculosis League of Cleveland and Cuyahoga County, 1601 Builders' Exchange Building, Cleveland, Ohio.* 55 pp.

This is an excellent mimeographed manual of great practical value. It is based on many years of experience in handling camps and camp sanitation in the Cleveland area.

It covers such items as choice of grounds, toilets, garbage disposal, kitchen sanitation, water supplies, bathing facilities, medical and nursing supervision, and fly and mosquito control.

Including, as it does, definite directions and sketches for the construction of camp sanitation facilities, it is a valuable practical treatise for those responsible for good health in camps. Any camp director would do well to have and study it.

CHARLES H. KEENE

Socialization of Medicine. *The Reference Shelf, Vol. 10, No. 5. Compiled by Julia E. Johnsen. New York: H. W. Wilson Company,* 1935. 335 pp. Price, $.90.

We may expect a number of books such as this on the general subject which it discusses. The introduction shows that the compiler has consulted the report of the Committee on the Costs of Medical Care. She speaks of the majority report, and one minority report, though there were 2 of the latter.

The book opens with a Brief stating the question and summarizing the affirmative and negative sides. This we think is well done. Following this there are some 42 pages of bibliography. Some of the authors quoted are entitled to speak on account of their mentality and training. Just why others have been quoted, it is difficult to understand. The same thing may be said of the extracts which are given further on.

As a source book for those who are sufficiently in touch with the subject to judge of the value of the material presented and the qualifications of the authors quoted, it can be recommended. The subject is being discussed by all sorts of people, sociologists, philanthropists, doctors, etc. Unfortunately, a popular subject always attracts a number of people who like to be on the top of any wave of popularity. MAZÝCK P. RAVENEL

National Medical Monographs—*Edited by Morris Fishbein, M.D. New York: National Medical Book Co.*

Vol. 1. Abnormal Arterial Tension—By Edward J. Stieglitz, M.S., M.D., F.A.C.P., 1935. 261 pp. Price, $3.00.

Vol. 2. Diseases of the Chest—By J. Arthur Myers, M.D., 1935. 385 pp. Price, $3.00.

Vol. 3. Commoner Diseases of the Skin—By S. William Becker, M.S., M.D., 1935. 283 pp.

Following a detailed table of contents, the author assembles his material in 16 chapters, illustrated by 66 figures, many of which are X-ray halftones, with a brief preface and quite adequate index. References are footnoted on the given page.

The subject falls into 4 general

phases—the normal vascular tension and its mechanism, the hypertensive, the hypotensive, and the relations to surgery and pregnancy. The public health worker will be especially interested in the chapters and discussion referring to etiology, prophylaxis, prognosis, and control-therapy. The early symptomless character of abnormal arterial tension, usually accompanied by a sense of well-being, and the great importance of recognition, in this stage, for proper control, emphasize the importance of periodic physical examinations and of preventive medicine which the author considers to be a purely individual problem—that is, one between the individual and his physician. Of significance are long continued mental fatigue, argumentative moods, tense play, cold and the "meal" effects, to say nothing of climate, race, physique, pregnancy, obesity, posture, infections, etc., and a legion of irritants and stimulants (and lack of same) which affect the muscles of the arterioles, constituting the underlying cause.

Such a thing as *idiopathic* or *essential* hypertension does not exist—a cause, perhaps more than one, always exists, and is quite invariably discoverable in the given case. Interesting tables classify these causes. A chart shows the causation of hypertensive arterial disease due to lead poisoning; another, the mechanism by which irritants finally produce arteriolar-sclerosis; etc. The hypertensive personality—the typical American—is a fine discussion. The nature and technic of tests are amply discussed.

We note a paucity of specific discussion on nutritional, *i.e.*, dietary, prophylaxis and therapy, though it is emphasized that the condition must be essentially a disturbance in nutrition. Perhaps the negative remark about the value of iodides and certain mineral elements (page 169) dismisses too lightly the relation of these elements to metabolism and the fundamental etiology. A special index summarizing references would no doubt have added to the usefulness of the volume, as appears in Clark and Drinker's *Industrial Medicine*, another of the monographs.

In summary, we have here a very readable and scientific text logically arranged with sub-heads, and covering a most momentous question in personal and public health.

In *Volume 2*, beginning with a detailed table of contents, the author assembles his material in 19 chapters, illustrated by 62 figures, mostly X-ray chest half-tones, with a brief preface and a combined index of authors and subject material. It has not been the purpose to cover the heart and thoracic vascular system. Part I covers the first infection type of tuberculosis (pathogenesis, tuberculin test, bronchoscopic and X-ray diagnosis, examination and classification, treatment, prognosis and preventives); Part II, reinfection type (establishment, acute and chronic types, management, artificial pneumothorax, operations and the magnitude of the tuberculosis problem); and Part III, non-tuberculous chest diseases (pneumonia, suppurative conditions, tumors, mishaps, moulds and yeast-like diseases, and pneumoconiosis). Each chapter ends with a summary and a list of references.

Public health workers having aught to do with pulmonary tuberculosis and its prophylaxis and management, including tests, accepted classifications, complications, and differential diagnosis, will find this a well balanced and valuable book written in clear-cut and convincing style. The same may be said for the non-tuberculous lesions such as those due to mould fungi, and the especially fine chapter on Diseases and Conditions Caused by the Inhalation of Dust, although in the latter possibly not enough space has been

given to the rapidly accumulating evidence that tuberculous involvement is difficult to substantiate in human cases of silicosis. Residual lesions and possible complications from the inhalation of irritant gases; and, in fact, the general subject of environmental predisposing and modifying factors, other than infestations and dust, are omitted. Hence, the stress of the presentation falls upon pathogenesis, diagnosis and clinical and surgical procedures, although the special chapter upon the magnitude of the tuberculosis problem recognizes the educational, economic and coöperative steps essential to the control of this disease.

In *Volume 3*, a brief preface points out that dermatology has passed through three eras: the *internist* (or internal factors) of the French school, the *externist* (or environmental factors) of the Viennese school, and the *bacterial*. The dawning era is the *biologic*. Man of all animals is the victim of dermatoses. The functional viewpoint and the lecture style are assumed in the present work. The volume comprises 26 chapters and 82 figures (all but 2, half-tones of skin conditions). There is no bibliography. The index comprises chiefly causal agents and subjects occurring in chapter sub-headings.

The work is preëminently one for the general practitioner of medicine who is being instructed by a specialist for the purpose of assisting him in his daily visitation by patients with all manners of skin and scalp troubles—a valuable *vade mecum* from etiology through diagnosis to therapy, including formulary. Outside of brief remarks upon the care of the skin and scalp, certain toxic and drug eruptions, and a half-a-dozen pages under the caption of The Skin in Industry, devoted chiefly to the rarer conditions, the work is quite beyond the average lay reader, as no doubt it should be. It should fill a definite need for the physician who wishes an up-to-date guide in the shape of a medium sized text, which is comprehensive and commendably free of verbosity. EMERY R. HAYHURST

Know Thyself: A Study in Mental Qualities—*By John Potts, M.D., D.C.L. Philadelphia: Dorrance,* 1935. Price, $3.00. 267 pp.

A philosophy of practical values and a study of the mind in action are here united in a plan for effective living which may be daily verified by observation of oneself and others. The simplicity of the language and the engaging style of the author make the book intelligible to the average man for whom it is written, while its unusual method of presentation and the subtile utilization of indirect suggestion might almost be said to guarantee its assimilation by the thoughtful reader.

The first 20 pages of the book are devoted to "The Problem," which is defined as the study, by the layman, of mental qualities of himself and others, with particular emphasis upon those qualities most to be desired. The last 23 pages are entitled "Progress," and are summed up in the concluding sentence of the book:

> A person who recognizes the mental qualities of men, women and children; who is intelligent enough to know what his social attitude, his duty, and his responsibility, if any, toward them should be, has acquired useful knowledge that will help him daily to pass through life with the maximum amount of pleasure and the minimum amount of grief.

"The Study," which comprises the remainder of the book, consists entirely of the 100 rules or observations on what constitutes *superior mentality*, together with the author's comments upon them. They reflect, he says, his experiences with people and his reading over years of time. A sampling of the rules will serve to indi-

cate their nature and variety, although it can give little idea of the penetrating wisdom of the discussion:

1. Persons having superior mentality have ability to see and to solve problems.
52. The social attitude of the superior mind is altruistic rather than indifferent, parasitic, or misanthropic.
100. The good mind has both will and ability to learn. In addition to these the great mind has great capacity for learning.

The author is to be congratulated on an outstanding contribution to the literature dealing with successful living, so much of which is of questionable value. The book is recommended to all "workers with men" for their personal enjoyment and profit and as an excellent volume to place in the hands of those who would increase their knowledge of themselves and achieve more happy, useful lives.

FREDERICK W. BROWN

A Geography of Disease: A Preliminary Survey of the Incidence and Distribution of Tropical and Certain Other Diseases—*By Earl Baldwin McKinley, M.D. Washington: George Washington University Press,* 1935. *Published as a supplement to the American Journal of Tropical Medicine.* 495 pp. Price, $5.00.

This preliminary survey of the incidence and distribution of so-called tropical diseases and certain other preventable diseases was prepared by Dr. McKinley as director of studies, with the coöperation of an advisory committee consisting of Frederick P. Gay, Richard P. Strong, and Theobald Smith, under the auspices of the Division of Medical Sciences of the National Research Council, and with the financial assistance of the American Leprosy Foundation. The object of the survey was to meet the growing need for more specific information concerning these diseases throughout the world. Data are presented from 15 of our southern states, and from nearly all the tropical and subtropical countries of the world. The collection of such information must necessarily have been extremely difficult in view of the fact that there exists no uniform method of recording or reporting the incidence of diseases in different countries, especially in those countries where tropical diseases are most prevalent, and where medical service and public health administration are in many cases poorly developed. The author and the committee are to be congratulated upon their courage and vision in attempting such a study.

The data were collected by means of a questionnaire sent to responsible authorities and by a study of official health reports. The results are given in the form of tables listing the presence or absence of individual diseases in each country now or previously: the distribution and approximate number of cases of each disease; the presence or absence of the vector, if any; and a statement as to whether the disease is considered an important health problem. Preceding the statistical material for each country is a brief statement concerning the geography, population, financial resources, principal products, climatic conditions, and special disease problems. Following the statistical section of the book is a series of summaries of selected tropical diseases with short articles by well known authorities concerning the problems involved in the control of these diseases. Finally, there is an appendix which records other interesting information which was not suitable for inclusion in the main body of the book.

The difficulty of obtaining uniformly accurate information either by a questionnaire or from official reports is evident from the statistical material presented. In many cases it

was necessary to supplement the answers to the questionnaires by an examination of the annual reports of health departments. Some of the tabular data cover definite periods of time, usually 1 or 2 years, while in other cases only the date of the filling out of the questionnaire is given. The reports used to supplement the questionnaire apparently varied widely in the amount of detail presented. In some cases these reports included all the mortality and morbidity statistics of the political unit concerned while others recorded only the statistics of the public health laboratory. This lack of uniformity in the source of data makes it impossible to compare with any degree of accuracy the incidence of diseases in different states or countries. Despite this defect the survey is valuable in giving a general idea of the distribution of diseases and pertinent data concerning the regions in which they occur.

It is obvious from the incompleteness of the data presented that there is a great need for a better and more uniform system of collecting morbidity statistics in this country and throughout the world. Practitioners must be induced to coöperate better in reporting diseases, and health departments must institute more accurate and uniform terminology. It is deplorable, for instance, that the species of malaria parasite is not more generally recorded, and that often no distinction is made between bacillary and amebic dysentery, nor the term amebiasis used to cover all conditions due to *E. histolytica*. It is to be hoped that this survey will help to stimulate this much desired improvement.

It is difficult to see how a survey of this kind could be made with any degree of completeness without the services of a large staff organized for the collection of morbidity statistics. Many national governments as well as the League of Nations already publish statistics on the incidence of a number of important diseases, but there is an increasing need for those organizations to devise methods whereby similar data may become available for all preventable diseases. If the present report can serve as a start for such an accomplishment it will have served a good purpose. It will serve as a valuable source of information to those interested in the distribution of the important diseases of warm countries and should indicate where such diseases can best be studied.

HENRY E. MELENEY

The Bacteriology of Typhoid, Salmonella, and Dysentery Infections and Carrier States—*By Leon C. Havens, M.D. Edited by Kenneth F. Maxcy, M.D. Foreword by Wilson G. Smillie, M.D. New York: The Commonwealth Fund. London: Humphrey Milford. Oxford University Press*, 1935. 172 pp. Price, $1.75.

Here is a book that summarizes knowledge gained through years of practical experience in the specialized and complicated field of the enteric diseases and sets this against a theoretical background gained by intensive reading and study. No bacteriologist in this country has had more actual laboratory experience with this group of bacteria than Dr. Havens, who served for 11 years as Director of the several Alabama State Laboratories in a territory where the endemic incidence of diseases of this group is particularly high. Few bacteriologists have specialized in the literature of this field to the same extent as Dr. Havens, as evidenced by his analytical discussions of the claims of various investigators found scattered throughout the book, and by the extensive bibliography appended to each chapter. From this rare combination there emerges this text which is more than

a guide to the bacteriology of the group—it is a guide to clear thinking regarding the problems presented by these organisms.

Thirteen chapters comprise the book, of which the first 3 deal with general aspects of the bacteriology of the group. Here is an excellent discussion of the antigenic composition of the cell and of bacterial variation as it affects physiological and serological characteristics of the various organisms. The explanation of the "diphasic" phenomenon and of the somatic changes in antigenic composition are illustrated by excellent, clear-cut, and yet simple, drawings. Five chapters deal with laboratory methods and, while Dr. Havens naturally favors those he developed and used so successfully in his years of work, he does not present them alone but offers alternative ones and in many instances presents tables of comparative results. He devotes 2 chapters each to a consideration of the 3 groups: Typhoid fever, Salmonella, and Dysentery, with special reference to the correlation of laboratory findings with clinical and epidemiological facts. The typhoid carrier problem is discussed and a plan presented for the organization and management of carrier surveys. His discussion of the classification and nomenclature of the Salmonella group is exceptionally clear and illuminating, as is his presentation of the antigenic relationships of the various strains of dysentery bacilli.

The book is attractively printed and arranged, reflecting the excellent editing of Dr. Maxcy. A short summary is presented at the end of each chapter. It should have a wide circulation not only among laboratory workers and investigators but also in the classroom and among those administrators and epidemiologists who are called upon to interpret the results of laboratory studies in these diseases.

In studying this book one cannot but feel how unfortunate it is that the brilliant brain of Leon C. Havens had to be stilled by his untimely death at the age of 41 years. EDMUND K. KLINE

BOOKS RECEIVED

THE PATIENT AND THE WEATHER. Vol. I, Part I. By William F. Petersen. Ann Arbor: Edwards Brothers, 1935. 127 pp. Price, $3.75.

MANSON'S TROPICAL DISEASES. 10th ed. Edited by Philip H. Manson-Bahr. Baltimore: Wood, 1936. 1003 pp. Price, $11.00.

THE ART OF LEADERSHIP. By Ordway Tead. New York: McGraw-Hill, 1935. 308 pp. Price, $2.50.

THE SANITARY INSPECTOR'S HANDBOOK. 2d ed. By Henry H. Clay. London: Lewis, 1936. 432 pp. Price, $4.75.

DON'T BE AFRAID. By Grace Adams. New York: Covici-Friede, 1935. 188 pp. Price, $2.00.

HEALTHFUL LIVING. By Harold S. Diehl. New York: McGraw-Hill, 1935. 354 pp. Price, $2.50.

CONVALESCENT CARE IN GREAT BRITAIN. By Elizabeth Greene Gardiner. Chicago: University of Chicago Press, 1935. 163 pp. Price, $1.50.

MAN, THE UNKNOWN. By Alexis Carrell. New York: Harper, 1935. 346 pp. Price, $3.50.

HEALTH AND HUMAN PROGRESS. By Rene Sand. New York: Macmillan, 1936. 278 pp. Price, $3.00.

A SELECTED PUBLIC HEALTH BIBLIOGRAPHY WITH ANNOTATIONS

RAYMOND S. PATTERSON, PH.D.

For the Treatment of Pneumonia—Studies in typing and treating pneumococcic pneumonias carried on by the Massachusetts State Health Department, and a review of modern methods for attacking the vexing pneumonia problem are described in non-technical language.

ANDERSON, G. W., and HEFFRON, R. Present Status of Pneumonia Problem. Pub. Health Nurs. 27, 12:633 (Dec.), 1935.

Food, Hormones and Sunlight—In this series of lectures on nutrition the author describes, among other studies, the examination of infant excreta to determine how much of various foods added to the infant's diet are absorbed. This work may have been done in this country too, but, if so, it has not been reported in the journals most health workers see.

ARMAND-DELILLE, P. Problems of Nutrition and Growth. J. State Med. 43, 12:683 (Dec.), 1935.

The Right to Marry—Beginning with this year, Connecticut couples may not obtain a marriage license until they obtain a medical certificate indicating freedom from syphilis.

BURGDOFF, A. L. Social Significance of the New Marriage Law. Connecticut Health Bull. 49, 11:247 (Nov.), 1935.

Influenza Epidemiology—Ten influenza outbreaks occurring during the past 15 years are studied and the progress recorded in graphs.

COLLINS, S. D., and GOVER, M. Influenza and Pneumonia Mortality in a Group of about 95 Cities in the United States during Four Minor Epidemics 1930–35 with a Summary for 1920–35. Pub. Health Rep. 50, 48:1668 (Nov. 29), 1935.

About Cancer Causes—Though this brief summary of existing beliefs and disbeliefs in regard to the many causes of cancer is labeled "partial," it seems really inclusive. Health workers generally would profit by a close reading of this easily understood survey which urges more detailed clinical study of cases.

CRAVER, L. F. Etiology of Cancer. J.A.M.A. 105, 23:1820 (Dec. 7), 1935.

Safeguarding Ice Cream Manufacture—Food poisoning on shipboard from ice cream made with preserved chestnuts was studied. *Staphylococcus aureus* probably was the causative organism, and insanitary practices in preparing the food were probably to blame.

GEIGER, J. C., *et al.* Food Poisoning from Ice Cream on Ships. J.A.M.A. 105, 24:1981 (Dec. 14), 1935.

Undulant Fever and Raw Milk—Evidence is presented indicating that an outbreak of undulant fever was caused by drinking raw milk from diseased cows which were infected with the strain from swine.

HORNING, B. G. Outbreak of Undulant Fever Due to Brucella Suis. J.A.M.A. 105, 24:1979 (Dec. 14), 1935.

Why Syphilis Is Not Stopped—All the deficiencies in public health preventive measures against syphilis are set down in 1-2-3 order and the chips are allowed to fall where they may. All administrators should read this.

STOKES, J. H. The Public, the Doctor, and the Syphilis Problem. J. Social Hyg. 21, 7–8–9:313 (Oct.-Dec.), 1935.

Evidence for Poliomyelitis Vaccine—Steps leading to the trial of attenuated poliomyelitis virus upon human beings and the record to date are described in absorbing detail.

KOLMER, J. A. Susceptibility and Immunity. J.A.M.A. 105, 24:1957 (Dec. 14), 1935.

Against Poliomyelitis Prophylaxis—A round dozen cases of poliomyelitis occurring 6 to 14 days after the injection of poliomyelitis virus, none of the patients being in epidemic areas or known to have been exposed, would appear to make further immunizations unwise.

LEAKE, J. P. Poliomyelitis Following Vaccination against the Disease. J.A.M.A. 105, 26:2152 (Dec. 28), 1935.

A Farm Editor Looks at Rural Health—Seeing our larger jobs as others see them is a wholesome experience. The hits, runs, and errors of rural public health and medicine in the United States and Canada are chalked up by an unprejudiced critic for all to observe.

STREETER, C. P. Reorganizing Rural Health Facilities. Pub. Health Nurs. 27, 12:638 (Dec.), 1935.

Sugar and Nutrition—When at the beginning this paper indicated its concern with the dangers of sugar in the diet, a silent bet was made that cancer would be dragged in before the score was completed. Sure enough, one authority quoted suspected sugar of being a possible cause of hypertension and arteriosclerosis, as well as cancer. According to the statistics given as of 1928, United States did not stand first in per capita consumption of sugar; three other countries exceeded it.

WALLACE, W. H. S. The Place of Sugar in the National Diet. Pub. Health, 49, 3:84 (Dec.), 1935.

ASSOCIATION NEWS

Professional Education

THE Professional Education Committee of the American Public Health Association under the chairmanship of W. S. Leathers, M.D., of Nashville, Tenn., met in New York on January 4, with a complete attendance of the members and good representation from sub-committees interested in several of the schedules under consideration for health department personnel.

New members of the committee who were present included Henry F. Vaughan, Dr.P.H., of Detroit, and Stanley H. Osborn, M.D., of Hartford, Conn.

The entire day was spent in formulating broad policies for Association activities, several progress reports being received from sub-committees for later consideration and editorial revision by a special committee. Consideration of the qualifications of health officers was deferred for a later meeting.

The New Membership Application Blank

THE discontinuance of the associate membership grade necessitated the printing of new membership application blanks. The new form is a decided improvement over the old one in that it provides for more information qualifying the applicant for election to membership.

Please give the new form the welcome it deserves by writing to the central office for a copy and handing it to some coworker who is not yet a member of the American Public Health Association.

APPLICANTS FOR MEMBERSHIP

The following individuals have applied for membership in the Association. They have requested affiliation with the sections indicated.

Health Officers Section

R. D. Dedwylder, M.D., Cleveland, Miss., Director, Bolivar County Health Dept.

Frank C. Diver, M.D., Raton, N. Mex., District Health Officer

James N. Dudley, M.D., Henrico County Health Dept., Richmond, Va., Health Officer

Thomas H. D. Griffitts, M.D., D.P.H., State Board of Health Bldg., Jacksonville, Fla., Surgeon, U. S. Public Health Service

Frances A. Kenyon, M.D., Woodrille, R. I., Health Officer

Stanley Mattmiller, 226 Chestnut St., St. Marys, Pa., County Health Officer

Lester F. Meloney, M.D., 156 Second St., Clifton, N. J., Health Officer

Laboratory Section

Ruth M. Cowdell, Box 1139, Hartford, Conn., Senior Assistant Serologist, State Dept. of Health

Robert A. Greene, Ph.D., P. O. Box 4694, Tucson, Ariz., Director, Arizona State Laboratories

John J. Phair, M.D., C.P.H., State Board of Health, Jacksonville, Fla., Acting Director, State Laboratory

Vernon L. Turgasen, 8015 Carpenter St., Chicago, Ill., Quality Supervisor, Armour & Co.

Seth T. Walton, V.M.D., Ph.D., City Health Dept., Charlotte, N. C., Director of Laboratories and Research

Public Health Engineering Section

Milton H. Bidwell, B.S., 171 Evans Ave., Freeport, L. I., N. Y., Bacteriologist, Sanitary Control of Shellfish

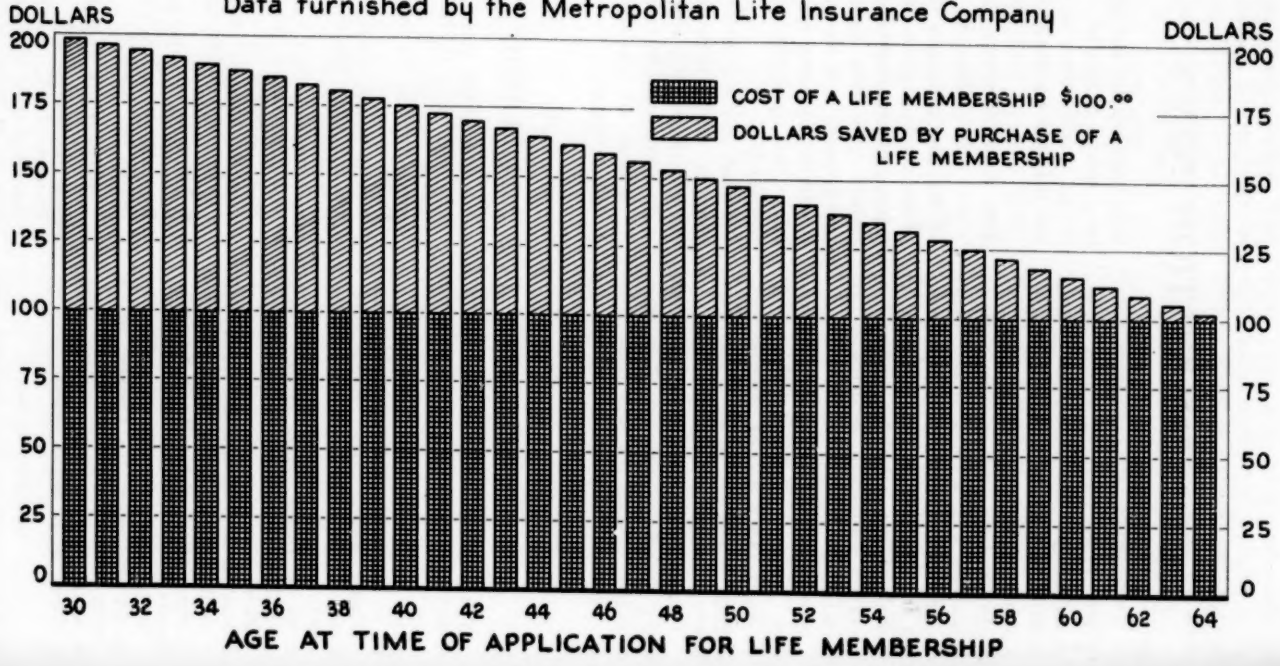
Edwin D. Cushman, M.S.P.H., 1113 Grant

DOLLARS SAVED BY THE PURCHASE OF A LIFE MEMBERSHIP

[In place of payment of annual dues]

IN THE AMERICAN PUBLIC HEALTH ASSOCIATION

Data furnished by the Metropolitan Life Insurance Company



St., Ypsilanti, Mich., Sanitary Inspector, Genesee County Health Dept.

Herbert C. Dyktor, St. Louis Health Dept., St. Louis, Mo., Sanitary Engineer, Milk Control Service

Martin A. Pond, B.S., 94 Ardmore St., Hamden, Conn., Student in Public Health at Yale University

Industrial Hygiene Section

Arthur S. Johnson, S.B., 142 Berkeley St., Boston, Mass., Assistant to the Manager, Engineering Dept., American Mutual Liability Insurance Company

Paul A. Neal, M.D., U. S. Public Health Service, Washington, D. C., Passed Assistant Surgeon, Office of Industrial Hygiene and Sanitation

Vital Statistics Section

Lidie C. Venn, A.B., 39 Lynwood Place, New Haven, Conn., Fellow of National Tuberculosis Assn.

Food and Nutrition Section

Abraham E. Abrahamson, Ph.G., 200 E. 16 St., New York, N. Y., Inspector of Foods, Dept. of Health

Charles F. Church, M.D., 4025 Huey Ave., Drexel Hill, Pa., Research in Nutrition, School of Medicine, University of Pennsylvania

Herman W. Erde, B.S., 415 Ditmas Ave., Brooklyn, N. Y., Supervising Inspector of Foods, New York City Dept. of Health

J. A. Keenan, Ph.D., Wisconsin Research Foundation, Madison, Wis.

Captain Michael Shipley, D.V.M., 1601 N. Ballinger St., Fort Worth, Tex., Veterinary Officer, U. S. Army

Child Hygiene Section

Joyce I. Hartman, M.D., Board of Education, Cleveland, O., Directing Supervisor, Medical Service, City Public Schools

Guy N. Magness, M.D., 6701 Delmar, University City, Mo., School Physician, City Public School

Public Health Education Section

Mrs. Ernest R. Grant, Hay-Adams House, Washington, D. C., Managing Director, District of Columbia Tuberculosis Assn.

Sister Marie, R.N., Regis College, Weston, Mass.

Marion Simonson, R.N., 353 W. 57 St., New York, N. Y., Field Adviser in Public Health, State Committee on Tuberculosis and Public Health

Public Health Nursing Section

Gladys A. Adams, R.N., 226 E. Fordham Rd., Bronx, N. Y., Executive Secretary, Bronx Tuberculosis and Health Committee

Lena Gaudet, R.N., 170 Elm St., Amesbury, Mass., Public Health Nurse

Anna R. Moore, R.N., 1410 Alaska Bldg., Seattle, Wash., State Advisory Public Health Nurse

Hilga S. Nelson, 297 Walnut St., Newtonville, Mass., Executive Director, District Nursing Assn.

Johanna L. Sogaard, State Board of Health, Jacksonville, Fla., District Supervisor of Nurses

Olive M. Whitlock, R.N., 816 Oregon Bldg., Portland, Ore., State Advisory Nurse

Epidemiology Section

Harold E. Miner, M.D., 65 Columbus Ave., Holyoke, Mass., District State Health Officer

NEWS FROM THE FIELD

DR. PARK RETIRES

DR. WILLIAM HALLOCK PARK, F.A.P.H.A., ex-President of the Association, noted bacteriologist and hygienist, retired on his 72nd birthday anniversary, December 29, from his position as Director of the Bureau of Laboratories of the Department of Health, New York City, the position which he has held for the last 41 years. This announcement was made by Dr. John L. Rice, Commissioner of Health, on December 26.

Under this arrangement Dr. Park will take a 6 months' vacation, after which he will retire permanently from the directorship and become Director-Emeritus of the Bureau. The new William H. Park Research Laboratories named in his honor are expected to be completed within a few months so that they can be dedicated while Dr. Park is still in the city's service. He will continue to work in the laboratory in an advisory capacity.

The new Acting Associate Director, Dr. Ralph Muckenfuss, member A.P.H.A., will be in charge during Dr. Park's absence.

As Professor of Bacteriology and Hygiene at the University and Bellevue Hospital Medical College since 1897, Dr. Park has been an active contributor in the field of public health. Among his connections he has been consulting bacteriologist and medical examiner in bacteriology for the New York State Department of Health and has been consulting bacteriologist for the U. S. Quarantine Service. He was president of the American Public Health Association in 1924 and has been vice-president of the New York Academy of Medicine. He has been widely honored for his researches in preventive medicine, with particular reference to diphtheria, tuberculosis, and poliomyelitis.

PSITTACOSIS VICTIM

A RECENT report from San Francisco states that Karl F. Meyer, M.D., F.A.P.H.A., head of the Hooper Foundation of the University of California, is recovering from psittacosis, which he contracted two months ago while engaged in extensive experiments to check the spread of the disease.

DR. CLARK RECEIVES MEDAL

THE American Chemical Society, New York Section, has announced that the William H. Nichols Medal, a highly prized honor, has been awarded to Dr. William Mansfield Clark, Professor of Physiological Chemistry at Johns Hopkins University School of Medicine, for 1936, " for researches of incalculable value to human welfare."

The medal will be presented to Professor Clark at a dinner meeting of the New York Section on March 6, when Dr. D. D. Van Slyke of the Rockefeller Institute and Dr. A. Beard Hastings of the Harvard Medical School will discuss these achievements, following which Dr. Clark will deliver the annual Nichols Medal address. Among previous recipients of this medal were Dr. Irving Langmuir, Nobel prize winner in chemistry, and President James Bryant Conant of Harvard University.

Dr. Clark is a graduate of Williams College and received the degree of Ph.D. in chemistry from Johns Hopkins in 1909. From 1910 to 1920 he was research chemist with the Dairy

Division of the U. S. Department of Agriculture and from 1920 to 1927 he was associated with the U. S. Public Health Service as Professor of Chemistry and chief of the division at the Hygienic Laboratory.

HOSPITAL SURVEY OF NEW YORK CITY

A COMPREHENSIVE hospital survey for New York City has been organized under the direction of the United Hospital Fund of New York under a grant of $40,000 from the Carnegie Corporation. A general committee of 100 representative citizens has been chosen and the direction of the survey has been placed in a Study Committee under the chairmanship of Dr. George E. Vincent. Other prominent members of this committee are: Dr. S. S. Goldwater, Dr. Charles Gordon Heyd, Dr. John E. Jennings, Dr. Eugene H. Pool, Dr. Willard C. Rappleye and Dr. Nathan B. Van Etten. Dr. Haven Emerson, who has directed other major community hospital surveys, is the Director of the Study.

PLANS FOR CHILD HEALTH DAY

THE Conference of State and Provincial Health Authorities has assumed the responsibility previously carried by the American Child Health Association for Child Health Day plans. A permanent committee has been appointed to handle the matter. The Secretary of this Conference is A. J. Chesley, M.D., F.A.P.H.A., State Health Officer, St. Paul, Minn.

PENNSYLVANIA TUBERCULOSIS SOCIETY

THE Pennsylvania Tuberculosis Society will hold its annual meeting at Allentown, Pa., on February 26. Speakers will include Dr. Edith MacBride-Dexter, the Secretary of Health of Pennsylvania, and Professor C.-E. A. Winslow, of Yale University.

OHIO HEALTH CONFERENCE HELD

THE 16th Annual Conference of Health Commissioners with the Ohio State Department of Health was held in Columbus, O., Nov. 13–15.

Included among the guest speakers were: J. A. Myers, M.D., of Minneapolis, Minn., member A.P.H.A., on Tuberculosis; Eugene L. Bishop, M.D., of Knoxville, Tenn., F.A.P.H.A., on Health and Sanitation in the Tennessee Valley; Martha M. Eliot, M.D., of Washington, D. C., on Maternal and Child Health; John Collinson, M.D., Dr.P.H., of the U. S. Bureau of the Census, Washington, D. C., F.A.P.H.A., on Vital Statistics; and J. A. Doull, M.D., of Cleveland, O., F.A.P.H.A., on A Survey of the State Health Department.

IMMUNIZATION DRIVE IN IOWA

STATE and local health authorities in Polk County, Ia., are coöperating with parent-teacher associations and other agencies in a campaign to immunize children against diphtheria.

It has been decided to devote one month each year to this campaign. This year it began in November, and is being publicized by radio, newspapers, and speeches. Much of the educational work is being undertaken by the Des Moines Council of Parent-Teacher Associations.

PHYSICIANS' PLACEMENT BUREAU

THE American Association of School Physicians recently established a placement bureau to aid physicians meeting its qualifications to find desirable positions, and to recommend to educational institutions medical inspectors qualified to organize and administer an efficient program of health service and health education.

For information, write to the Director of the Bureau, Arville O. DeWeese, M.D., formerly president, Director of

Health and Physical Education, Kent State College, Kent, Ohio.

NEW HEALTH UNIT IN ALABAMA

THE establishment of the Henry County Health Department on a full-time basis brings the total number of these full-time units in Alabama to 56.

The new unit will begin functioning January 1.

WPA TUBERCULOSIS CAMPAIGN IN DISTRICT OF COLUMBIA

WITH $99,000 available from the Works Progress Administration, a campaign to eradicate tuberculosis in the District of Columbia has begun.

X-ray machines have been made available in the city of Washington for the taking of roentgenograms by means of the paper method. Physicians may refer patients either for an initial film or for a check on treatment, all the work to be done without cost to the patient.

RHODE ISLAND PUBLIC HEALTH ASSOCIATION INCORPORATED

ON January 7, 1936, the Rhode Island Public Health Association was incorporated under the laws of the state and held its first annual meeting. The first president elected was Dr. Edward A. McLaughlin, the State Director of Public Health of Providence.

GRADUATE STUDY ABROAD

THE Institute of International Education located at 2 West 45th Street, New York, has a publication, *Opportunities for Graduate Study Abroad Open to American Students*, which is available on request. The Institute also supplies pamphlets on fellowships and assistantships available in transatlantic countries, and a bulletin, *Fellowships and Scholarships Open to American Students for Study in Foreign Countries*, is available at a cost of 25 cents.

COSMETIC SAMPLES IN MAINE

COSMETIC manufacturers have filed approximately 2,500 samples of their varied products with the Department of Health and Welfare, Augusta, Me., in an effort to have their products salable under Maine's new cosmetic law, effective January 1. Cosmetics kept for unlawful sale or use are subject to forfeiture. The registration fee has been reduced from $1 to half that amount.—*Printers Ink*, Jan. 2, 1936.

DR. FLEXNER REAPPOINTED

ON January 6, Governor Herbert H. Lehman, of New York, reappointed Dr. Simon Flexner, of New York City, as Chairman of the State Public Health Council. Two new members to the Council were appointed, Dr. Clayton Greene of Buffalo and Dr. George Baehr of New York City. Dr. Herman G. Weiskotten, dean of the Syracuse University Medical School, was named to succeed Dr. Frederick F. Russell, formerly of Brooklyn, who resigned.

The Public Health Council of New York State is charged with the duty of formulating the New York State Sanitary Code.

MEXICAN ACADEMY OF MEDICINE ELECTS NEW OFFICERS

THE National Academy of Medicine of Mexico announces the following new officers, elected recently:

President—Dr. Gustavo Baz
Vice-president—Dr. Ignacio González Guzmán
Secretary (permanent) — Dr. Alfonso Pruneda
Secretary (annual)—Dr. Mario Quiñones
Treasurer—Dr. Manuel Martínez Báez

TVA HEALTH

EFFECTIVE January 1, the responsibilities of the Tennessee Valley Authority in Health, Sanitation, Medical and Safety are being administered through a newly established Division of Health and Medical Service under the direction of E. L. Bishop, M.D., F.A.P.H.A., as Director of Health.

In the past, these responsibilities have been discharged through three sections in two different divisions, but under the administration of a single division director, Dr. Floyd W. Reeves, who served as the administrative officer of both divisions. The new division was created at the suggestion of Dr. Reeves who is changing his status from that of an administrative officer to consultant, and safety was included because of its close functional relationship to the other services.

RED CROSS RECEIVES BEQUEST

UNDER the will of Mrs. Clara A. Hapgood Higgins Smith, the American Red Cross will receive $3,482,535, according to a statement disclosed on December 27 when the transfer tax appraisal was filed in the New York court. The Red Cross is the residuary legatee in the will.

Other bequests by Mrs. Smith, who was a resident of Allegany County, N. Y., included local hospitals, the New York State Charities Aid Association, the Stony Wold Sanitarium at Lake Kushaqua, N. Y., and the Association for Improving the Condition of the Poor, New York City.

BACTERIOLOGICAL AWARD

AN annual award of $1,000 will be made to a young man or woman for distinguished work in bacteriological research, it was announced at the closing session of the 37th Annual Meeting of the Society of American Bacteriologists in New York. A feature of the award, which is expected to become the principal American recognition of achievement in this field, is that it will be given only to research workers in college or university laboratories who are younger than 31.

The first winner will be announced at next year's meeting in Indianapolis. Recognition will be given to original work either in bacteriology or in immunology, and a group of scientific societies have been asked to share in its sponsorship. The American Association of Immunologists and the American Society for Experimental Pathology have already agreed to coöperate in selection of the winner. The prize has been guaranteed for the next 5 years by the Eli Lilly Company, biological manufacturers of Indianapolis.

CONNECTICUT CANCER STUDY

IT is stated that the Connecticut State Department of Health will soon begin a study of the mortality and the prevention and treatment of cancer, in accordance with an act passed by the last legislature at the recommendation of the State Medical Society.

The Bureau of Preventable Diseases will carry on the study, and Herbert F. Hirsche, of Hamden, Conn., member A.P.H.A., has been appointed Research Statistician for the work.

FULL-TIME UNIT IN INDIANA

THE first full-time county health department in Indiana has recently been set up in Lake County. The 1935 general assembly passed a law permitting the establishment of full-time county health units and the Lake County commissioners adopted a resolution setting up the new unit. In addition, provision was made for one sanitary inspector, one stenographer and clerk, and four public health nurses, all employed full time, effective January 1.

William D. Weis, M.D., of Crown Point, Ind., is Health Commissioner.

DENTAL DESENSITIZER

ALL dentists without restrictions may obtain the dental desensitizer which was discovered in the laboratories of the Columbia Dental School by Dr. Leroy L. Hartman. It will not be patented, Frederick Coykendall, chairman of the board of the university, has announced.

The desensitizer is a liquid applied to the dentin of the tooth, and is effective for more than twenty minutes.

Dr. Hartman's formula, which has been the goal of dental research since the practice of modern dentistry began, aids the science by lessening the pain that occurs in the preparation and filling of tooth cavities.

AWARD TO MRS. THOMPSON

AT its 61st annual meeting held on November 15, 1935, the New Jersey Health and Sanitary Association awarded to Mrs. Geraldine Livingston Thompson a certificate "in recognition of her outstanding accomplishment in promoting the welfare of the people of New Jersey through her interest and activity in public health and social welfare."

This annual award is given by the association in such a form that it attracts public notice to service rendered in public health and related fields.

PERSONALS

HANS ZINSSER, M.D., Sc.D., Fellow A.P.H.A., was named on January 8 to the new Charles Wilder Professorship of Bacteriology and Immunology in the Harvard Medical School, Boston, Mass.

DR. W. A. MCPHAUL has been appointed State Health Officer of Florida by Governor Sholtz. Dr. McPhaul has been full-time County Health Officer of Escambia County, Fla., for several years. He was formerly connected with the North Carolina State Board of Health and was Health Officer of Charlotte, N. C. Dr. McPhaul succeeds Dr. Henry Hanson, F.A.P.H.A.

NAOMI DEUTSCH, R.N., F.A.P.H.A., has been appointed Director of Public Health Nursing Activities of the Children's Bureau in Washington. Miss Deutsch goes from the University of California in Berkeley to act as consultant for the important public health nursing projects under the auspices of the Children's Bureau. She is chairman of the Public Health Nursing Section of the Association.

DR. FRANCES C. ROTHERT, member A.P.H.A., formerly of Hartford, Conn., has been appointed to the Children's Bureau, U. S. Department of Labor, with responsibility for a group of states in the southern portion of the United States.

DR. DORIS A. MURRAY, formerly of Rochester, N. Y., has been appointed to the Children's Bureau and will represent the Bureau in certain of the eastern states. Dr. Murray has been on the staffs of the Maryland State Department of Health and the Cattaraugus County Department of Health, N. Y.

DR. SARA DIETRICH, recently of the staff of the New York State Department of Health, has been appointed to the Children's Bureau, U. S. Department of Labor, to be in charge of a group of states in connection with the new Social Security program.

DR. ROBERT C. HOOD, formerly of Parkersburg, W. Va., has been appointed director of crippled children's work with the Children's Bureau, U. S. Department of Labor, Washington. Dr. Hood has for some years been in the practice of pediatrics in West Virginia.

DR. JOHN R. BRUCE, of Marshfield,

Mo., has been appointed Health Commissioner of Webster County. He formerly served as County Physician.

DR. RANSOM L. CARR, of Rose Hill, N. C., has been appointed Health Officer of Dublin County, to succeed Dr. Clarence H. White, of Kenansville, resigned.

DR. HERBERT D. CHAMBERLAIN, of McArthur, O., has been appointed Health Commissioner in charge of a new health unit in Vinton County.

DR. WILLIAM GROSSMANN, JR., of Petersburg, Va., has been appointed Assistant Epidemiologist in the Virginia State Department of Health.

DR. SHOCKLEY D. GARDNER, of South Boston, Va., has been appointed Health Officer of the Valley Health District, with headquarters in Harrisonburg.

DR. JAMES N. DUDLEY, of Danville, Va., has been appointed Director of the Henrico County Health District, with headquarters in Richmond.

DR. THOMAS B. PAYNE has been appointed Health Officer of Fredericksburg, Va., to succeed the late Dr. Justus Lee Cooke.

WILLIS C. BEASLEY, formerly of Johns Hopkins University, Baltimore, Md., is in Alabama, establishing headquarters for 4 states now being studied in the national survey of health conducted by the U. S. Public Health Service. Montgomery has been designated regional headquarters for Alabama, Georgia, Louisiana, and Texas.

DR. CARL A. PETERSON, of Moline, Ill., has been named a District Superintendent of Health on the staff of the Illinois State Health Department. Moline will be his address.

DR. HARRY A. YEAGER has recently been appointed Health Officer of Litchfield, Ill.

DR. SOPHIE B. D. EBERLE, recently of New Haven, Conn., has been appointed in charge of the Pueblo Indians in the vicinity of Albuquerque, N. M.

DR. FRANK C. DIVER, of Springer, N. M., has been appointed Health Officer of the Ninth New Mexico Health District.

DR. DANIEL L. SECKINGER, formerly Epidemiologist for the Georgia State Department of Health, has been appointed Assistant Health Officer for the District of Columbia.

DR. SAMUEL J. DICKEY, who has been on the staff of the Pennsylvania State Department of Health for about 10 years, has been appointed Medical Director of Chester County, Pa.

DR. HOWARD F. STRAUB, of Selingrove, Pa., has been named Medical Director of Snyder County, Pa., succeeding Dr. Russell W. Johnston.

DR. DUNN HAMILTON ROW, of Indianapolis, Ind., sailed November 1, for Shikarpur, Baluchistan, India, where, with 4 other eye specialists, he will conduct an eye clinic.

DR. CHARLES E. HOLLAND has been appointed Health Officer of Bloomington, Ind., succeeding Dr. Russell A. DeMotte.

LAWRENCE W. BASS, PH.D., Fellow A.P.H.A., Director of Research of the Borden Company, has been elected Chairman for 1936 of the New York Section of the American Chemical Society. He succeeds Professor Arthur W. Hixon, of Columbia University.

HERMAN N. BUNDESEN, M.D., of Chicago, F.A.P.H.A., is a Democratic candidate for Governor in Illinois.

ABBOTT B. MITCHELL, M.D., member A.P.H.A., has recently severed his connection with the Allegan County Health Department, Allegan, Mich., and has taken a position with the Michigan State Department of Health as Director of the Bureau of County Health Administration.

HUGH S. CUMMING, M.D., Fellow

A.P.H.A., Surgeon General of the U. S. Public Health Service, Washington, D. C., has been appointed one of an executive committee of ten, named by the Health Section of the League of Nations at its recent meeting in Geneva, Switzerland.

ELSBETH VAUGHAN, of St. Louis, Mo., F.A.P.H.A., was recently awarded the Nightingale Medal by the International Committee of the Red Cross, Geneva, Switzerland.

DR. MARION F. HARALSON, Senior Surgeon, U. S. Public Health Service, is now Acting Secretary of the Colorado State Board of Health, in the absence of Roy L. Cleere, M.D., member A.P.H.A., of Denver, Colo., who is at the School of Hygiene and Public Health of Johns Hopkins University, Baltimore, Md.

THOMAS F. O'BRIEN, M.D., member A.P.H.A., has been appointed Acting Health Officer for the City of Hartford, Conn., succeeding Charles P. Botsford, M.D., F.A.P.H.A., who retired after 27 years' service.

DR. JOHN A. BUCCIARELLI has succeeded Myron J. Brooks, M.D., member A.P.H.A., retired, as Health Officer of New Canaan, Conn.

DR. MICHAEL D. RIORDAN has been appointed Health Officer of Windham, Conn.

DR. CHARLES MOLINE, of Sunderland, Mass., was recently chosen President of the Franklin County Public Health Association.

JOHN L. LAVAN, M.D., F.A.P.H.A., for 4 years Director of the Department of Public Health and Welfare of Kalamazoo, has resigned to become Commissioner of Public Health of Grand Rapids, Mich.

DR. CHARLES WALTER CLARKE, Medical Director of the American Social Hygiene Association of New York, member A.P.H.A., has been appointed temporary Director of the Bureau of Venereal Disease in the New York City Department of Health.

DR. RILEY H. MILLER, of Ulysses, Kans., has been named Health Officer of Grant County.

LOUIS C. KRESS, M.D., member A.P.H.A., Director of the New York State Division of Cancer Control, has been appointed Chairman of the State Cancer Committee of the American Society for the Control of Cancer, succeeding Dr. Burton T. Simpson.

DR. EDMOND H. SAUVIGNET, of Laredo, Tex., has been appointed Health Officer of Webb County, succeeding Dr. Albert T. Cook, who became Health Officer of the City of Laredo.

DR. ROBERT W. GORDON has been appointed Deputy Manager of Health and Charity of the Health Department of Denver, succeeding Bertram B. Jaffa, M.D., F.A.P.H.A.

DR. JAMES B. UNGLES, of Satanta, Kans., has been appointed Health Officer of Haskell County, succeeding the late Dr. Loring V. Miner.

DR. WILLIAM J. SCOTT, of Ottawa, Kans., was recently placed in charge of the Franklin County Health Unit.

DR. PAUL T. THIBODAUX, of Donaldsonville, has been appointed Health Officer of Donaldsonville, La.

DR. JOHN A. SKLADOWSKY was recently promoted to be full-time Medical Health Officer in the Baltimore Health Department and was assigned to the Western Health District. He has been connected with the Department since 1920.

HARRY GARLAND TIMBRES, M.D., member A.P.H.A., has been appointed assistant in biostatistics at Johns Hopkins University School of Hygiene and Public Health, Baltimore, Md.

FRANK A. KIERNAN, member A.P.H.A., former Executive Secretary of the Massachusetts Tuberculosis League, has been named Director of the New York Tuberculosis and Health As-

sociation. He fills the position left vacant by the resignation of Harry Hopkins two years ago to become Federal Emergency Relief Administrator.

DR. HARVEY J. SKARSHAUG, of Guthrie Center, Ia., has been appointed Health Officer of Fargo, to succeed Burton K. Kilbourne, M.D., Fellow A.P.H.A., who resigned to become State Epidemiologist of Montana.

DR. V. D. KERNS, of Duncan Falls, Ohio, has been appointed Health Officer of Pickaway County, succeeding Dr. Charles C. Beale, of Circleville, resigned.

DR. SAMUEL W. SHELTON, of Guin, Ala., has been appointed Health Officer of Winston County.

DR. GEORGE E. NEWTON, of Fayette, Ala., has been appointed Health Officer of Jackson County, to succeed Dr. Edward A. Thorne, resigned.

DR. PAUL G. SHELL, of Marianna, Fla., was recently placed in charge of a new health unit in Jackson County.

DR. FRANK V. CHAPPELL, formerly of Madison, Fla., has been appointed Health Officer of the Jacksonville District, succeeding Dr. Thomas E. Morgan.

DR. RALPH J. SYKES, of Jackson, N. C., has been appointed Health Officer of Surry County, to succeed Dr. James Allen Whitaker, of Rocky Mount, resigned.

ALFRED D. GREGG, M.D., member A.P.H.A., of Tarboro, N. C., has resigned as Health Officer of Edgecombe County.

DR. FRANCIS EDGAR MAHLA, of Marion, Ohio, has been appointed Assistant State Director of Health, succeeding James E. Bauman, member A.P.H.A., who had held the position 43 years.

DEATHS

FRANCIS X. MAHONEY, M.D., Fellow A.P.H.A., Health Commissioner of Boston, Mass., almost continuously for more than 20 years, died January 14, at the age of 64 years.

DR. KATHARINE BEMENT DAVIS, of Pacific Grove, Calif., died December 10, at the age of 75 years.

CONFERENCES

Feb. 3–15, Institute for Training of Tuberculosis Workers, under the auspices of the National Tuberculosis Association, New York; to be held at New York University, Washington Square, New York.

Feb. 26, Annual Meeting of the Pennsylvania Tuberculosis Society, Allentown, Pa.

Mar. 2–6, Twentieth Annual Session of the American College of Physicians, Detroit, Mich.

Apr. 1–3, American Water Works Association—Canadian Section, Hamilton, Ont.

Apr. 22–25, National Tuberculosis Association, New Orleans, La.

May 11–15, American Medical Association Convention, Kansas City, Mo.

May 14–16, American Water Works Association—Pacific Northwest Section, Aberdeen, Wash.

June 24–27, Seventh Annual Meeting, Western Branch, A.P.H.A.—meeting simultaneously with Canadian Public Health Association—Vancouver and Victoria, B. C.

June 8–12, 56th Annual Convention, American Water Works Association, Los Angeles, Calif.

July 6–11, The Royal Sanitary Institute, Southport, England.

July 25–Aug. 1, The Second International Congress of Microbiology, London.

July 27–31, Second International Congress on Mental Hygiene, Paris.

Sept. 8–10, International Union Against Tuberculosis, Lisbon, Portugal.

Oct. 29-31, Annual Meeting of the Association of Military Surgeons, Detroit, Mich.

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